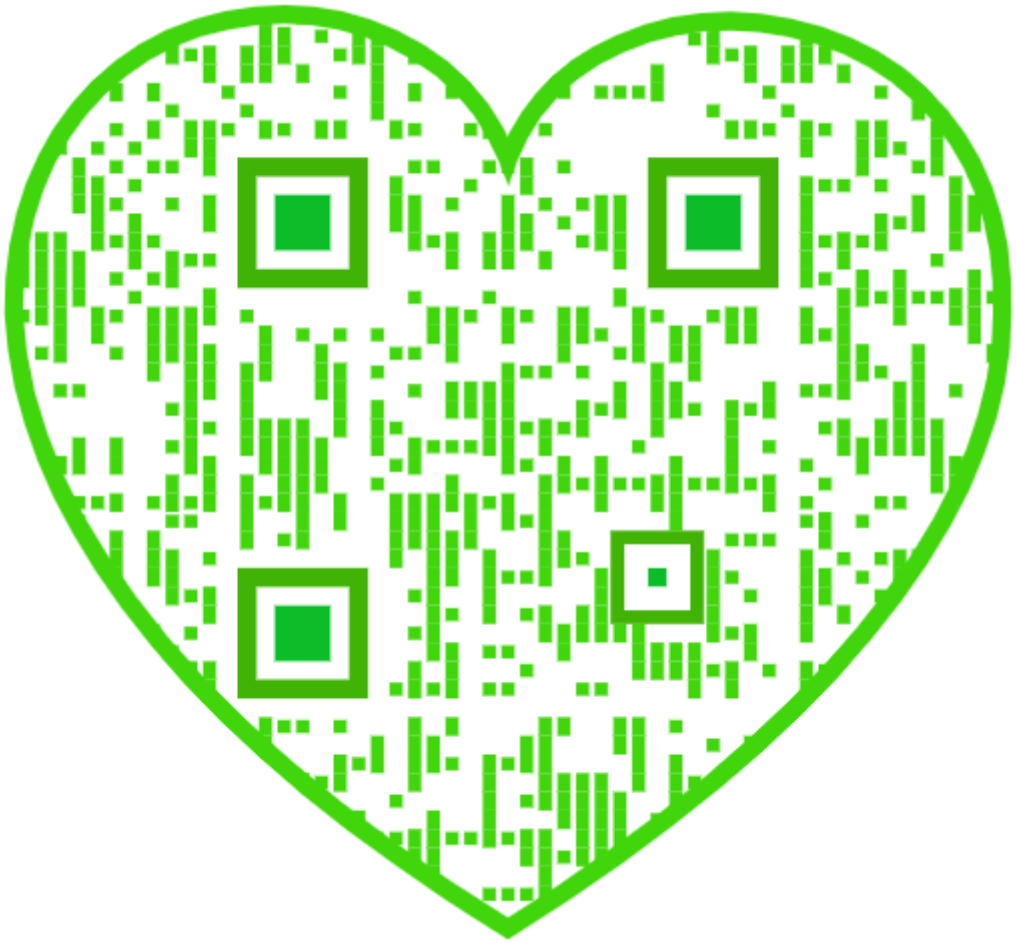

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UNITED STATES OF AMERICA.

HORSE-BREEDING;

BEING THE

GENERAL PRINCIPLES OF HEREDITY

APPLIED TO

THE BUSINESS OF BREEDING HORSES,

WITH

INSTRUCTIONS FOR THE MANAGEMENT

OF

Stallions, Brood Mares and Young Foals,

AND THE

SELECTION OF BREEDING STOCK.

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BY

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Editor of "The Breeder's Gazette," "Breeders' Trotting Stud Book," "Percheron Stud Book,"
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Illinois Veterinary Medical Association, etc.

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PREFACE.

A very large proportion of the matter contained in this volume was prepared for publication several years ago when I had more leisure to study and write upon the topics herein considered, and when I was fresher from the field of practical experience than now. Much of it has since been printed in fragments at various times, some of it in the form of editorial articles for the monthly journal that was so long under my management, some in essays or addresses at meetings and conventions of breeders of live stock, and still other portions of it in the weekly stock-breeders' paper that for more than three years past has occupied my almost constant attention. A little more than four years ago I thought myself about ready to gather up the fragments that were already prepared and give them to the public in book form; but other and more pressing duties intervened, and it is only within a few months past, having been relieved from official duties that had for three years claimed all the time that I could possibly spare from the management of THE BREEDER'S GAZETTE, that I have found leisure to look over and arrange the

matter which has been gradually accumulating for so long a period. I give it now to the public, realizing that, in common with all human effort, it must needs be far from perfect, but with a feeling of satisfaction in knowing that the work has at least been conscientiously done; and that such parts of it as are not derived from a knowledge bought with my own personal experiences have, for their foundation, the teachings of others who are regarded as eminent authorities in the specialties upon which I have quoted them. To the introductory chapters, wherein the general principles of breeding are discussed, I have given much thought; and I am confident they may be studied with profit, not only by horse-breeders, but by all who are disposed to investigate the laws which govern the transmission of hereditary qualities from parent to offspring, whether it be in the human species or in the lower orders of animal life. In the descriptions of breeds I have endeavored to be judicially candid and fair; to "nothing extenuate nor set down aught in malice;" and where controverted points have been touched upon, while I have endeavored to state my views plainly, and to sustain them by such arguments and facts as to my mind are conclusive, yet I have tried to do so in a manner that would not prove offensive to those whose opinions and conclusions may differ from my own.

Aside from the introductory chapters on the general principles of breeding, which are applicable alike

to all breeds and all varieties of live stock, I have endeavored to make the work a practical guide to the management of the breeding stud—a book which any farmer or farmer's boy, or any novice in the business of horse-breeding, may read and study with profit. In the course of my long experience as editor of a live-stock paper, covering a period of about sixteen years, the constantly recurring questions that have been sent in for answer have served to direct my attention especially to the points upon which information is most frequently sought, and these points I have endeavored to most fully answer in the pages which follow.

While I have not intended that this book should in any sense be regarded as a veterinary work, yet I have thought I might add greatly to its practical usefulness by incorporating with it the material portions of several articles, prepared at my request, by Prof. James Law, of Cornell University, N. Y., and previously published under my direction, wherein he treats of some of the diseases to which stallions, brood mares and young foals are especially subject. And I have also added a number of pages of matter of a similar nature, prepared especially for this work by N. H. Paaren, M. D., State Veterinarian of Illinois, whose high scientific attainments and many years of extensive practice have especially fitted him to give valuable counsel upon such topics.

In the belief that the book will be found interesting to all students of the science and art of breed-

ing, and especially helpful to those who have the care and management of breeding studs, whether on a large or small scale, it is given to the public with a full consciousness of the fact that it does not contain a tithe of what might profitably be written or said upon the subject.

J. H. SANDERS.

CHICAGO. Feb. 1, 1885.

CHAPTER I.

GENERAL PRINCIPLES OF BREEDING.

It is stated in Holy Writ that "God made man a little lower than the angels," and by common consent the horse is voted next highest in the scale of created beings. It will not be inappropriate then, in a treatise mainly devoted to the breeding of this, the noblest of the brute creation, to discuss some of the general principles which govern the transmission of hereditary qualities from parent to offspring and which are beyond a question substantially the same throughout animal life. Through the practical application of these laws to the business of breeding domestic animals, which for many years past has so largely occupied the attention of intelligent men in Europe and America, the great mass of our agricultural population have become familiar with their inexorable power and force; and with a knowledge of the immutability of these laws has come a realization of the stern fact that the human species furnish no exception to their operation.

The passage in the Decalogue, which declares that the iniquities of the fathers are visited upon the children unto the third and fourth generation, is clothed with a new and startling significance since it has come to be generally understood that this declaration is a concise statement of the operations of a physiological law, from which there is

absolutely no escape. That the physical, as well as the mental and moral infirmities and peculiarities of the father and mother, are visited upon their children, even *beyond* the third and fourth generations, is as true when applied to the human family as it is of cattle, horses, sheep and swine.

It is not my purpose to attempt to controvert the principle that "all men are born free and equal," which stands as the corner-stone of our political system. Undoubtedly this is true when applied to "rights before the law," but that all men are born physically, morally and intellectually equal will scarcely be claimed by the most ardent admirer of our democratic institutions. There is a solid foundation, in physiological fact, for the admiration with which the "first families of Virginia" have been regarded in some parts of our country, and the same may be said of many of our old families in New England and other parts of the country. Dr. Oliver Wendell Holmes makes his "Autocrat of the Breakfast Table" give utterance to his belief in this great truth and his faith in the value of pedigree in the human family when he says: "I go always, other things being equal, for the man who inherits family traditions and the cumulative humanities of at least four or five generations." To know that a man or woman is descended from an old family whose record has been honorable, beyond reproach and without taint, is the very best possible evidence, next to his own individual record, that he is also worthy of confidence and respect; and a taint in the blood of an opposite character should certainly be regarded with as much distrust as a similar taint in the blood of any of our domestic animals, *and for the same reasons.* What is "bred in the bone" will be transmitted. Beauty of form and feature, strength and force of intellect, elegance and grace of motion, integrity and honesty of character, susceptibility

of culture and refinement or boorish stupidity, as well as all the virtues and vices, are as clearly transmissible and inheritable qualities in man as is the color of the hair or the shape of the body in horses or cattle.

A subject of such vast importance, involving as it does so much for weal or woe to the human race, and which places in the hands of the intelligent stock-breeder such power over the animal kingdom, may well command the attention of thinking men, aside from its practical value as an aid to an intelligent reproduction of desirable forms and qualities in our domestic animals. It has been said of Bakewell, one of the first great improvers of live stock in Great Britain, that he regarded the animals upon his farm as wax in his hands, out of which in good time he could mould any form that he desired to create. In fact all our domestic animals have been, to a great degree, moulded and fashioned by the hand of man. The same uniformity that now characterizes the bison, the elk and the deer probably belonged to the horse, the cow, the sheep and the hog, in a state of nature. The ponderous English Cart-horse, the fleet courser and the diminutive Shetland pony, are all supposed to have descended from originals that were as uniform in their characteristics as are the members of a herd of bison upon our western prairies. The Short-horn, the Hereford, the Devon, the Jersey and all of the various breeds into which our cattle are now divided, are descended, it is believed, from the same original type.

CAUSES OF VARIATION FROM ORIGINAL TYPES.

That the changed conditions of life to which animals have been subjected by domestication—the variety of uses to which they have been put, the food upon which they have subsisted, the climate in which they have been reared, and

selection for especial uses—have produced the variations which are now so apparent, is generally admitted. Very much of this divergence is due to climatic influences, which alone are sufficiently powerful, in the changes of food and of habit which necessarily follow, to account for nearly all the varieties which have been produced. A warm climate and a bountiful supply of nutritious food from birth to maturity promotes growth and development, while a scanty supply of nutrition and a rigorous climate have a positive tendency in the opposite direction. A knowledge of the effect of heat and cold upon growth and development has been taken advantage of by breeders for the purpose of producing dwarf specimens. The breeder of Bantam fowls is careful to have his chicks hatched late in the season, so that the early approach of cold weather may arrest development. The bleak, barren and tempestuous islands—lying in the high latitude of 59 and 60 deg.—north of Scotland, with their scanty subsistence and long winters, have dwarfed the horse of that country until he appears as the diminutive Shetland pony, while, from probably the same original, the rich herbage, nutritious grains and mild climate 10 deg. further south, on the European coast, has given us the immense draft-horses of ancient Normandy and Flanders.

But while climate and the necessarily accompanying influences have done much to cause the divergence which now exists in races that were once uniform, selection by the hand of man has also been actively at work, in some cases co-operating with the influences of climate, thereby accelerating the transformation, and in others counteracting its effect. We have an illustration of this in the horses of Canada. It is quite evident that the causes that have given us the tough, shaggy pony of Lower Canada, if continued without interruption for a succession of generations, and

accelerated by the efforts of breeders in selecting animals for the purpose of reproduction, with the same object constantly in view, would in course of time give us a race as diminutive as the ponies of the Shetland Islands. But this climatic influence has been retarded and counteracted by Canadian breeders, who have rejected the smaller specimens for breeding purposes, and have constantly drawn upon the large draft breeds of Europe for fresh crosses. To such an extent has this infusion of fresh blood been carried for twenty-five years past, especially in Upper Canada or Ontario, that the influences of climate have been overpowered and the progression has been decidedly in the opposite direction. The efforts of Canadian breeders in this direction have been aided materially by the improved condition of agriculture in the Dominion, which has led to a more liberal system of feeding and more thorough protection from the rigor of the climate. And thus the forces and influences of nature, in some cases aided and in others counteracted by the efforts of man, have constantly been at work breaking up the uniformity which originally characterized all our domestic animals, until divergence from the original type has become, in many instances, truly wonderful.

The influences of selection, in creating divergence from a type singularly uniform, finds a most striking illustration in the case of the domestic pigeon, of which there are now nearly 300 known varieties, more or less distinct, and all probably descended from the common wild rock pigeon. Among these varieties the divergence is remarkable, not only in the color of the plumage, which in the orignal is uniform, but in the shape and markings of the various parts. Who would imagine, at first thought, that the pouters, the carriers, the runts, the barbs, the fantails, the

owls, the tumblers, the frill-backs, the jacobins, the trumpeters, etc., and all their sub-varieties, with differences so strongly marked, are descended from one common parent stock! Yet, that this is true, and that all the varieties from the original type have resulted from changed conditions of life, climatic influences and artificial selection and crossing, is generally admitted by naturalists.

It is one of the principles of heredity, that when there is a great uniformity in a species divergences from the usual type in the offspring are slight and rare; but when this uniformity, from no matter what cause, has been broken up, divergences in the offspring are frequent and great, although there is always present a tendency, more or less powerful, to revert to the original type. This tendency is most frequently manifested when breeds or races, widely differing in their present forms, are crossed upon each other. In such cases, or violent crosses as they are called, it frequently happens that the progeny resembles neither parent, but shows strong marks of the type from which both of its ancestors originally sprung. Darwin gives numerous illustrations of this tendency to reversion in his experiments with pigeons of various breeds and colors, one of which I quote, as follows:

I paired a mongrel female barb-fantail with a mongrel male barb-spot, neither of which mongrels had the least blue about them. Let it be remembered that blue barbs are excessively rare; that spots, as has been already stated, were perfectly characterized in the year 1676, and breed perfectly true; this likewise is the case with white fantails, so much so that I have never heard of white fantails throwing any other color. Nevertheless, the offspring from the above two mongrels were of exactly the same blue tint as that of the wild rock pigeon, from the Shetland Islands, over the whole back and wings; the double black wing bars were equally conspicuous; the tail was exactly alike in all its characters, and the croup was pure white; the head, however, was tinted with

a shade of red, evidently derived from the spot, and was of a paler blue than in the rock pigeon, as was the stomach. So that two black barbs, a red spot and a white fantail, as the four purely-bred grandparents, produced a bird of the same general blue color, together with every characteristic mark, as in the wild *Columba livia*, or rock pigeon.*

This tendency to reversion in different breeds of domestic animals when crossed accounts for many of the disappointments which breeders experience in their efforts to improve their stock, and serves greatly to complicate the breeding problem.

MODIFICATIONS PRODUCED BY CHANGED CONDITIONS OF LIFE.

It is quite certain, from what we know of the effect of climate and of changed habits upon animals in a state of domestication, that if two branches of the same tribe or species, essentially alike in every feature, should, by some chance, become separated and compelled to subsist under widely differing conditions of life, being left entirely to themselves and the operations of natural laws, in course of time a very marked difference would occur in their structure or habit. There is a tendency in all animal life to adapt itself to the conditions under which it must exist; but a change may be so abrupt and complete as to overcome this tendency; and, under such a condition, the race would speedily become extinct, or gradually die out with a few generations of sickly and enfeebled descendants; but, under circumstances less abrupt and unfavorable, a few might survive, being those individuals that, from some

* Those who have a desire to investigate this subject, as illustrated by the breeding of pigeons, will find a very full history of the various breeds, their processes of formation, and the effects of selection and crossing of breeds, in Darwin's "Variations of Animals and Plants under Domestication," Vol. I, pp. 163 to 272.

peculiarity of organization, suffered least from the change. These animals, in their turn, would reproduce the peculiarities of their race, modified, to some extent, by the new conditions which environed them; and these again would produce animals still better adapted to the new order, until, in course of time, we should have a race widely differing from the original type, created or evolved by a survival of those best fitted to exist under the new order of things, and remoulded and refashioned by the changed conditions of life.

If we accept the commonly-received doctrine of the origin of the human race—that is, that all mankind are descended from a common parentage—we are driven to the conclusion that all the differences which are so apparent in the human family at the present day are the result of the operation of the law of adaptation to changed conditions and of climatic influences, to which I have just referred. And yet there is as great a divergence from a uniform type in the human race as in any of the lower orders of animals that are recognized as belonging to a single species.

An illustration of this law of adaptation may be found in the cattle of Texas. These animals, which we call "native Texans," are undoubtedly descended from the Spanish cattle, brought at a very early day to Louisiana and Mexico, but in form and habit they have been greatly changed from their Spanish ancestry. They roam over the plains of Texas, eat its grasses and drink its waters with impunity, and, under these conditions, increase and multiply at a prodigious rate, enjoying a remarkable degree of immunity from disease of any kind. But let the cattle of any other region be taken to that State and serious losses result from what is commonly known as Texas fever. It is not my intention, at this time, to go into an account of the nature or

cause of this disease; it is sufficient for my purpose to state the simple and well-known fact that all attempts at the introduction of a new race of cattle upon the plains of Texas have been attended with very serious losses. The proportion that have been found able to survive, under the conditions to which they are there subjected, has been found to be so small that few breeders or herdsmen will take the risk of bringing valuable cattle into the State. And yet a *few* do survive; and their descendants are as free from liability to the disease as are the native Texans themselves. The Spanish cattle, when first brought to that region, undoubtedly had to submit to the same fatal ordeal, and the thousands upon thousands of their descendants which today are found in that State afford us a striking illustration of the ability of a race to adapt itself to conditions which at first threatened it with extinction. The silent and invisible processes of nature so change the system and adapt it to the new order of things that what was a deadly poison to the ancestor is comparatively harmless to the progeny.

I might multiply illustrations of a like character, from the human race as well as from the lower orders of animals, but the principle is so well known and so universally recognized that it is useless to discuss it farther; and I have only alluded to it here as tending to show how numerous and powerful are the agencies that are constantly at work producing variations and changes in animal life.

In the practical business of breeding domestic animals it is important that due prominence be given to the operation of the laws to which I have alluded; for it follows that a race or breed most perfectly adapted to a certain locality, a certain mode of life, conditions of climate, and character of subsistence, may, in time, when transported to a distant clime, or even when subjected to changed conditions of life

in the same locality, lose all its distinguishing characteristics and become practically worthless. On the other hand, a race of but little value in its native state may be so modified by a change in climatic conditions, or by the character, quality and quantity of the aliment furnished, as to become of the highest value to the breeder; and these modifications, although frequently so slow as to be almost imperceptible in a single generation, are accelerated by the powers of inheritance under a continuation of the conditions which inaugurated them. A high or low temperature, and abundant or scanty nutrition, will, as before stated, affect physical development either favorably or unfavorably. Elevated plains, low marshes, and mountain ranges are each adapted to support a species of animal life in some respects distinct from the others; and hence a knowledge of the effect of the various climatic conditions, and of the different kinds of food, becomes of the utmost importance to the breeder in determining the kinds of stock that he can produce with profit.

There is perhaps no variety of animals that has been domesticated by man in which the effects of climate and nutrition are more apparent than in horses. Temperate regions, grassy plains, and, consequently, abundant nutrition, produce increased size and strength; mountain ranges, with bleak, cold climate and scanty subsistence, dwarf the frame and produce the hardy, diminutive pony. The fertile plains of Germany and Flanders, with their salubrious climate and abundant herbage, have been the home, from the very earliest period of history, of the ponderous draft-horses which still distinguish that region, and have been the source from which all the countries of the world have drawn the foundation for their draft breeds. The bleak and barren Shetland Islands, and the mountainous tract

which lies between the plains of India and the crest of the great Himalaya range, are the homes of races of diminutive ponies, rough, shaggy and hardy. The highest inhabited land of Asia, which forms the source of the Ganges, the Indus and the Brahmapootra—a country as rugged and bleak as can well be conceived—contains immense numbers of small, sinewy and agile horses. The extreme regions bounded by the mountains of Siberia on the north, the Sea of Okhotsk on the east, and the Little Altaic Mountains on the west—the home of the Kalmucks—abounds in a tough and hardy race of ponies.

I have not been able to find an exception to this law of nature in the history of the world. Wherever the horse has existed for centuries on rich, fertile plains, and in a temperate climate, we find him distinguished for size and strength; wherever he has been the inhabitant of inhospitable, mountainous regions he becomes diminutive and hardy. Of course these results have obtained where the horse is left largely to take care of himself. Man may do much by supplying warm stables and abundant food, and by selection, to counteract the influence of climate, but in spite of his utmost care the tendency will constantly be as nature has pointed out. Mountainous regions and a rigorous climate will produce the toughest, hardiest horses—as we have seen in the New England Morgans and the Canadian ponies of our own country—while our rich and fertile prairies and luxuriant valleys are adapted by nature to be the home of the ponderous draft-horse.

Prof. Low, in his great work, "The Domesticated Animals of the British Islands," has a very interesting chapter on the effect of climatic influences upon animal life, from which I quote the following :

The effect of heat is everywhere observed, as it modifies the

secretions which give color to the skin, and the degree of covering provided for the protection of the body, whether wool or hair. In the case of the human species the effects of temperature on the color of the skin, and, with this, on the color of the eyes and hair, are sufficiently known. We can not pass from the colder parts of Europe to the warmer without marking the progressive diversities of color, from the light complexion of the northern nations to the swarthy tinge of the Spaniards, Italians and Greeks; and when we have crossed the Mediterranean into Africa the dark color, which is proper to all the warmer regions of the globe, everywhere meets the eye. The Jews, naturally as fair as the other inhabitants of Syria, become gradually darker as they have been for a longer or shorter time acclimated in the warmer countries; and in the plains of the Ganges they are as dark as Hindoos. The Portuguese, who have been naturalized in the African colonies of their nation, have become entirely black. If we suppose, indeed, the great races of mankind to have been called into existence in different regions we must suppose that they were born with the color, as well as the other attributes, suited to the climates of the countries which they were to inhabit. It accords with this supposition that the Negro remains always black, even in the highest latitudes to which he has been carried; and that the black races of the Eastern Islands retain the color proper to them in the mild temperature of Van Diemen's Land. The Mongolian, even in the coldest regions of Northern Asia, retains the hue distinctive of his family, but with a continually deepening shade as he approaches to the intertropical countries. The native of China, of a dull yellow tint at Pekin, is at Canton nearly as dark as a Lascar. The American Indian retains his distinctive copper hue amid the snows of Labrador, but on the shores of the Caribbean Sea becomes nearly as black as an African.

Temperature likewise affects the size and form of the body. The members of the Caucasian group towards the Arctic Circle are of far inferior bulk of body to the natives of temperate countries. The Central Asiatics, in elevated plains, are sturdy and short, the result of an expansion of the chest; the Hindoos are of slender form and low physical powers, so that they have almost always yielded to the superior force of the northern nations from the first invasion of the Macedonians to the ultimate establish-

ment of European power in the Peninsula. The Negro, on the other hand, in the hottest and most pestilential regions of the habitable earth, where the Caucasian either perishes or becomes as slender as a stripling, is of a strength and stature which would be deemed great in any class of men—affording a strong presumption in favor of the opinion of the distinctness of his race and its special adaptation to the region in which it has been placed.

In quadrupeds the effects of temperature are everywhere observable in the covering provided for their body, whether wool or hair, and which in the same species is always more abundant in the colder than in the warmer countries. In all quadrupeds there is a growth of down or wool underneath the hair, and more or less mixed with it. In warm countries this wool is little if at all developed; but in the colder it frequently becomes the principal covering of the skin, forming along with the hair a thick fur. In the warmest regions the domestic sheep produces scarcely any wool; in temperate countries he has a fleece properly so called, and in the coldest of all his wool is mixed with long hair which covers it externally. The wool, an imperfect conductor of heat, preserves the natural temperature of the body, and thus protects the animal from cold, while the long hair is fitted to throw off the water which falls upon the body in rain or snow. But in the warm season the wool, which would be incommodious, falls off, to be renewed before winter, while the hair always remains. The dog, too, has a coat of wool which he loses in countries of great heat, but which in colder countries grows so as to form along with the hair a thick fur, so that in certain cold countries there have been formed breeds of dogs to produce wool for clothing. The dogs of Europe conveyed to warm countries frequently lose even their hair and become as naked as elephants, and in every country their fur is suited to the nature of the climate.

Similar to the effects of temperature is that of humidity, the hair becoming longer and more oily in the moister countries. Even within the limits of our own islands, the ox of the western coasts, exposed to the humid vapors of the Atlantic, has longer hair than the ox of the eastern districts. Even the effect of continued exposure to winds and storms may modify parts of the animal form. There are certain breeds of gallinaceous fowls

which are destitute of the rump, so-called. Most of the common fowls of the Isle of Arran, on the coast of Scotland, have this peculiarity. This little island consists of high hills, on which scarcely a bush exists to shelter the animals which inhabit it from the continued gales of the Atlantic. The feathers of a long tail might incommode the animals, and therefore, we may suppose, they disappear; and were peacocks to be reared under similar circumstances it is probable that, in the course of successive generations, they would lose the beautiful appendage which they bring from their native jungles.

The effects, likewise, of altitude are to be numbered among those which modify the characters of animals. In general the animals of mountains are smaller and more agile than those of the same species inhabiting plains. In man the pulse increases in frequency as he ascends into the atmosphere, so that, while at the level of the sea the number of beats is 70 in a minute, at the height of 4,000 feet the number exceeds 100. The air being rarer a greater quantity of it must be drawn into the lungs to afford the oxygen necessary to carry off the excess of carbon in the system. But gradually, as man and other animals become naturalized in an elevated country, the digestive and respiratory organs, and with these the capacity of the chest and abdomen, become suited to their new relations. Humboldt remarks on the extraordinary development of the chest in the inhabitants of the Andes, producing even deformity; and he justly observes that this is a consequence of the rarity of the air, which demands an extension of the lungs.

The effects have been referred to of use or exercise in modifying certain parts of the animal form. The limbs of many animals inured or compelled to speed become extended in length, as of the dogs employed in the chase of the swifter animals. The limbs of an animal deprived of the means of motion become feeble and small, as the wings of domesticated birds. In the natural state the cow has a small udder, yet sufficient to contain the milk which her young requires; in the domesticated state, by milking her, the organ becomes enlarged so as to contain a quantity of milk beyond what the wants of her own offspring demand. Nor are the characters thus acquired confined to the individuals on which they have been impressed, but may be transmitted to their posterity.

The lessons taught by these illustrations are obvious. None of our improved breeds are adapted to *all climates* and *all conditions* of life. To be at their best they must each be kept, as nearly as possible, under the same conditions of food and climate as those under which they have attained their excellence. Any material change in either of these conditions is liable ultimately to make a material change in the character of the breed. These changes are usually unfavorable ones, although not necessarily so. Change of itself, when in the direction of better care, more generous feeding and more genial climate, will tend to produce greater size, a more graceful form and greater excellence. At the same time improvement in these particulars is quite likely to be at the expense of what is termed hardiness, or ability to withstand exposure and rough usage.

ACCIDENTAL VARIATIONS OR "SPORTS."

When animals in a state of nature are not disturbed in the enjoyment of the conditions under which they have existed for ages, as the American bison or buffalo, the elk, the deer, the wolf, etc., the uniformity which prevails among all the individuals of the race is remarkable; and all the peculiarities of structure, color and character are transmitted from generation to generation with almost unerring certainty; and here the maxim of the breeder, that "like produces like," scarcely ever meets with an exception. Such animals are, in the truest sense of the word, *thoroughbred*, or purely bred. There has been no commingling of blood or crossing of various strains to give the race a composite character, and hence when we have seen the sire and dam we can tell with certainty what the progeny will be. Were any of our domesticated animals *thoroughbreds*, in the sense that the bison, the elk or deer are thoroughbreds, the

breeding problem would be a simple one, and like would invariably produce like so long as the conditions of life remained the same. The same principle holds true in the reproduction of vegetable life. An absolutely pure seed reproduces its kind, but when cross-fertilization has once taken place the result is uncertain. If the flower of the Baldwin apple tree be fertilized by the pollen of a Winesap the seed from this union will produce neither the one nor the other. It will be an apple, because both of its parents were apples; but as they were of different varieties, or forms or character, so the produce will have a character of its own, differing from both of its ancestors. And even if the stigma of the Baldwin be fertilized by pollen of its own kind, the result is uncertain, because the parent is itself the result of cross-fertilization. The application of this principle to the crossing of different races of domestic animals is evident, and I shall have occasion to refer to it hereafter.

But, notwithstanding the uniformity of which I have spoken, in the produce of absolutely pure or unmixed races there arises occasionally what is termed an accidental variation from the established type—a *sport*, as it is frequently called. The color of the American deer is of a fixed type, and a departure from uniformity in this particular is very rare—yet a white deer is occasionally found—and so of other animals in which the color is an equally well-established characteristic. Man has five fingers on each hand and five toes on each foot, and in this particular the race is uniform; yet a "sport" is occasionally found where the number of fingers or toes is increased to six. When these accidental variations once occur they are liable, under favorable conditions, to be transmitted by inheritance; but under the ordinary operations of Nature's laws, when the conditions of life remain unchanged, these anomalies usually disappear

within one or two generations, and the normal and characteristic type of the race is resumed. A well-authenticated instance of the transmission of accidental variations is found in the oft-quoted case of Edward Lambert, whose whole body, with the exception of the face, the soles of the feet and the palms of the hands, was covered with a sort of horny excrescence, which was periodically moulted. His six sons all inherited the same peculiarity, and the only one of the six that survived transmitted it, in turn, to all his sons. This abnormal character was transmitted through the male line for six generations, and then disappeared.* It is a very remarkable illustration of the peculiarities of heredity that the female members of this family should have failed to inherit this peculiarity. Another very remarkable case of this nature which came under my own observation was that of a family residing in Iowa, where the mother and three grown daughters were entirely destitute of hair, but the sons all had quite as much as the average of men. We have also several well-authenticated cases of the transmission, for a few generations, of an abnormal number of fingers or toes, as in the case of the Colburn family, where each of the members had a supernumerary toe and finger, which anomaly was transmitted, although irregularly, for four generations before it entirely disappeared. The writer is personally cognizant of a case in which the second and third toe of each foot were united, and which anomaly has been transmitted for three generations to one only out of an average of eight descendants in each family. But, as before remarked, when the conditions of life remain unchanged these anomalies almost invariably disappear, and the descendants ultimately resume the typical character of the race.

* "Philosophical Transactions," Vol. XVII, p. 23.

From the fact that these accidental variations have shown themselves to be, in a limited degree, transmissible by heredity, we may infer that if selections were made with a view to their perpetuation they might ultimately become fixed characters. Indeed, there is a considerable weight of evidence tending to show that even variations produced by mutilation, or by other artificial means, are sometimes transmitted, especially when the mutilation has been intimately connected with the nervous system. Dr. Prosper Lucas gives numerous well-authenticated instances of this character, and is decidedly of opinion that variations or mutilations that are the result of disease are transmissible. That eminent scientist, Dr. Brown-Sequard, gives an interesting account of some experiments with guinea pigs. By an operation upon a certain nerve he produced epileptic convulsions; and the produce of the animals upon which this operation was performed manifested the same symptoms.* But, notwithstanding the numerous instances given by the eminent authorities above quoted, I am of the opinion that the cases of the transmission of these artificially produced variations are so rare as to be practically of no account in the calculations of the breeder.

The law which governs the transmission of these accidental variations, whether they be the result of a "sport" or of external influences, appears to be, that when such variations from the common type are in antagonism to the conditions of life to which the individual is subjected, the variations are not perpetuated; while, on the other hand, if they are in conformity to the existing wants or conditions, thereby better fitting the individual to succeed in the struggle for existence, natural selection and a survival of the fittest will tend to perpetuate them.

*"Proceedings of the Royal Society of Great Britain," Vol. X, p. 297.

From the foregoing it is evident that the laws of heredity tend to reproduce in the progeny the character of the ancestors, and that when the ancestry is of a fixed and uniform type the maxim that "like produces like" admits of few exceptions. Yet there are exceptions even here, as we have seen in the case of sports; and the modifications produced by changed conditions of life, adaptation to new uses and new modes of subsistence, tend to vary what, under the operation of the unrestricted laws of heredity, would fix a given type and leave the breeder's art powerless to effect change or improvement.

Heredity, which makes of every individual the sum, or essence, of that which has lived before him, is essentially a conservative force, and opposes all change, all progress, all improvement; but evolution, which compels heredity to give way to internal and external causes, and modifies both the physical and mental organism, places in the breeder's hands the means of effecting wonderful changes.

EXTENT OF HEREDITARY INFLUENCE.

I have spoken of two forces that, in their effects, appear to be diametrically opposed to each other—heredity, which makes of every individual the sum or essence of that which has preceded it, and evolution or spontaniety, which constantly tends to give to animal life new forms and to each individual peculiarities which belong to it alone. Of these heredity is unquestionably the stronger force, because, as I have before remarked, when uniformity has once been established the general principle that like produces like finds very rarely an exception. In fact the influence of heredity is *always* present, and in the reproduction of animal life never fails to assert itself in a greater or less degree. Every living thing brings forth young after its own

kind—in some cases the exact counterpart of the parent, and in others slightly modified; but always showing more or less of the parent type. Men do not gather grapes of thorns nor figs of thistles, neither do Short-horn cows bring forth buffalo calves nor draft-mares produce thoroughbred race-horses. Hence, although we may frequently meet with very apparent differences between the parents and the progeny, yet a moment's reflection will show us that the points of resemblance are always very much greater than those of difference. We are so accustomed to look at the operation of this law in its *details* that we overlook the aggregate of results. We mate a purely-bred Essex sow and boar, and look upon it as a matter of course that the pigs produced will all be black and possess the general characteristics of the Essex breed; but if, having selected our breeding pair with a view to the transmission of a peculiar form of the head or shape of the ear we find in the produce that few, and possibly none, possess the peculiarity which we have sought to perpetuate, we are apt to lose faith in the power of heredity. And yet it would be an argument *against* the uniform operation of this law were the produce all to possess the peculiarity which distinguished the sire and dam, for this was in them an exceptional feature; and the fact that the pigs possessed, in lieu of this peculiar mark, the character that belonged to their ancestors in general is rather a testimony to the inherent power of heredity than otherwise. Were our pair of pure Essex swine to produce Poland-China or Berkshire or Yorkshire pigs there would be room for suspicion or for complaint that the laws of heredity had been violated; but such a transgression of Nature's law so rarely occurs that when it does take place we may properly call the result a "sport." Hence, the failure of an individual to reproduce features that are peculiar

to itself, or of a pair of individuals distinguished for the same peculiarity, to transmit it to the offspring should excite no surprise in the mind of the breeder. Let it be remembered *always* that *heredity transmits with certainty only what has become a fixed character in the race.* Sports, accidental variations and individual peculiarities only occur in opposition to this law, and their transmission is at best uncertain. Heredity may be depended on to govern the general characteristics which determine the species and the less general ones which distinguish the breed, but when we come to individual characteristics, which have never acquired a general character in the ancestry, it frequently fails. In short, *the transmission of the greater share of all the characteristics is a thing of universal occurrence*, but their transmission *in toto* is an ideal conception that is never realized; and only in proportion as the ancestry has assumed a fixed and unvarying type do we find this ideal of the effect of heredity approximated.

That peculiarity called atavism, or reversion, so often noticed in our domesticated animals, and which has so frequently set at naught the calculations of the breeder, has often been quoted as an illustration of the failure of the law of heredity; but it is in fact only a tribute to its power. By selection, change of climate or of nutrition, or by crossing, or by all of these means combined, we may succeed in obliterating certain well-defined characteristics, and in modifying a given type, until the new form or character that we have created will, in its turn, be transmitted with reasonable certainty; but suddenly the germ that has lain dormant for so many generations asserts itself, and, greatly to our surprise, the characteristics of the original stock will reappear. As I have before remarked, these cases of reversion most frequently occur when cross-breeding is resorted

to. The counter currents of hereditary influence, which ear by this means brought into contact, having a common origin, awaken to life the germ which has for generations been a silent factor in each of the newly-created breeds, and enables it to again assume control of the organism.

In addition to the general and well-defined operation of the laws of heredity to which I have alluded, its operations in the transmission of individual characteristics, although not clearly defined, and never to be depended upon, are often wonderful. The son is frequently, in some respects, the exact duplicate of the father, and the daughter of the mother. Sometimes a peculiarity which belonged to the grandsire lies dormant in the son, but crops out as strong as ever in the second or third generation. Again, we find peculiarities transmitted from father to daughter, and from mother to son, and even especial sexual characteristics transmitted by the father through a daughter to a grandson, or by the mother through a son to a granddaughter; but it is worthy of remark that in no case are all the peculiarities of any one individual transmitted. Indeed, it would be strange were it otherwise, because each individual is the joint product of two other individuals, each endowed with peculiarities of his own; and that each should transmit itself as an entirety is absolutely impossible. Rarely do we find in the individual so produced a blending of these peculiarities in exact proportion—as one might theoretically argue would be the result were the parents of equally well-established types—but rather that in some respects the offspring resembles the father, in others the mother, in some forming a partial or exact mean between the two, and in still others we find the produce utterly unlike either, but possessing an individuality or character peculiarly its own. I might illustrate this by instances from the experience of

every breeder, but it is not necessary. The effect has been observed by all who have given any attention whatever to the subject of breeding.

THE FORMATION OF BREEDS.

I have spoken of the uniformity which characterizes animals of a given species in a state of nature, and of the various causes that serve to disturb this uniformity in our domesticated animals when subjected to changed conditions of climate or nutrition. I have also treated of the effect of heredity, which makes of the offspring the sum or essence of the qualities that existed in its progenitors, and of the opposing law of evolution or spontaniety which tends to give to each animal a character of its own. I now propose to consider how these known laws and forces may be utilized in the formation of breeds; and, at the threshold of this division of my subject, it is necessary that we should understand what is meant by the terms used.

The animal kingdom is divided by naturalists into four great branches, *Radiata*, *Mollusca*, *Articulata* and *Vertebrata*. These branches are again divided into classes. The *Vertebrata*, to which branch all our domesticated animals belong, are divided into eight classes, the last of which are the *Mammalia*, embracing all animals that give suck to their young. These classes are divided into genera, and these again into species. For example: we have the genus *Equus*, of which the horse, the ass, the zebra and the quagga are species; and these different species are again divided, with reference to certain peculiarities, into breeds. A breed, therefore, is a classification by which we distinguish a group of animals possessing qualities which are not common to all animals of the same species, and which peculiarities have become so firmly established that they

are uniformly transmitted by heredity. Thus, we have the Shetland ponies, a breed of horse possessing all the general characteristics of the species to which they belong, but especially distinguished from other breeds by their diminutive size; and the Devons, a breed of cattle uniformly of a deep red color, and possessing other distinctive features that are not uniformly found in any other breed of cattle.

It will be observed that these divisions, from first to last, are more or less arbitrary; and, as it is impossible to define exactly the point where the mineral kingdom leaves off and the vegetable kingdom begins, or to distinguish positively the line of demarcation between vegetable and animal life, so throughout the entire animal kingdom the various divisions or classes approach each other by almost imperceptible gradations, until in many cases it is impossible to locate the dividing line. This is especially true of breeds. We may assume any standard that our fancy may dictate, as the color or texture of the hair; the shape or size of any particular part of the body, as the head or the ear; any particular function, as the quantity or quality of the milk in cattle; peculiarities of locomotion, as the trot or pace in the horse; of habit or instinct, as exemplified in the Setter or in the Shepherd dog, etc.; and classifying with reference to the possession of any of these assumed peculiarities we may divide a species into breeds. Theoretically there is no limit to the extent to which this division into breeds might be carried; but practically it is confined to marked differences in *appearance, function, use, disposition* or *quality.* And whenever we have, by any means, produced a group or family of animals that possess and transmit uniformity in any particular, in which there is a lack of uniformity in the species to which they belong, they are fairly entitled to be classed as a breed.

Taking advantage of the almost numberless shades of divergence from the original type to be found among the different species of domesticated animals, the laws of heredity and spontaniety enable man to work wonderful transformations and improvements by selecting such individuals as most nearly approximate to his ideal and which manifest a tendency to assume the desired form. By coupling such individuals there is a probability that the quality for which they were selected will be reproduced in the offspring, and that it will be even more prominent than in the parents. I say there is a *probability* that this will be the result, but it is by no means certain, for, as I have remarked, only the general and firmly fixed characteristics which distinguish the species are transmitted with absolute certainty, and the transmission of accidental qualities or especial excellence in any given particular, while always possible, can never be depended upon with certainty. If, however, we select parents both distinguished for the same accidental variation or accidental excellence the chances that it will be transmitted to the offspring are, theoretically, twice as great as when only one of the parents is in possession of the desired quality; and if in the produce from this coupling we see manifestations of the desired tendency we may unite animals so bred with an increased probability that they, in turn, will transmit it to their offspring. It is mainly by this process of careful selection and coupling, with a view to the possession of certain desirable qualities, persevered in for many generations, that all noted breeders have succeeded in moulding the forms or establishing the breeds that have given them celebrity.

It must be borne in mind that the very processes of nature which make it possible for man to effect improvement in any species of domesticated animals conspire to

make the work of creating a new type from heterogeneous materials extremely difficult. In making selections with a view to perpetuating any variation from an established type we must always begin with such individuals as have manifested a tendency to assume the desired form and transmit it to their offspring. With a mixed and heterogeneous ancestry, representing various shades of divergence from the original type of the species, progress in any given direction by selection will, under the most favorable circumstances, be slow, and the results will frequently be anything but satisfactory. There is always a tendency in the offspring of a mixed or improved race to revert to the original form of the species from which it is derived. This I have shown is most apparent where animals of a widely different character are coupled, as in the case of cross-breeding with distinct varieties or breeds, which, although not without its compensating advantages in many cases, introduces new elements of divergence. Hence the breeder will often find failure where he most expected success. The force of heredity is usually exerted to compel the progeny to adhere to the character which has become fixed in the species, rather than to follow variation from the established type that was accidental or spontaneous in the immediate ancestry; but when, through selection of both parents with reference to this particular for several generations, the influence of heredity has once been enlisted in the transmission of an accidental variation it lends its powerful aid in favor of the perpetuation of the improved form. Spontaniety may occasionally interpose a new feature or atavism turn us back toward the original, but by continuing to select from the families which have been bred with reference to the desired form we shall eventually succeed in fixing the new type so firmly that its transmission will be the rule and failure the

exception; and when this point has been reached we have succeeded in forming what may justly be called a breed.

IN-BREEDING AND CROSSING.

It has been claimed by many that success in establishing desired forms or qualities may be obtained with the greatest certainty, and in the least possible time, when selection is confined to the same family. Thus, we find a certain male that manifests an unusual degree of excellence in some particular, and which, it has been found, he usually transmits to his offspring. We select a female manifesting the same tendency, and the two are coupled. Possibly the offspring may not show a trace of the unusual excellence we have sought to perpetuate. We reject this, and couple the same sire and dam a second time, and perhaps we are rewarded by offspring possessing the desired quality. This produce, if a female, when of proper age is coupled with her own sire, and this produce again, if a female, is bred to the same male, that was her sire as well as her grandsire. This process is sometimes resorted to for three or four successive generations, with a view to intensifying or perpetuating a quality for which the sire is especially noted, and which it is found he transmits with certainty; for it is a well-known, although inexplicable fact, that of two animals bred precisely alike, and manifesting the same spontaneous variation, one will transmit the peculiarity with considerable certainty, while not a trace of it will appear in the produce of the other. The same course of breeding is often resorted to by coupling the son with his own dam, and then, if the produce be a female, using upon her the same male, that is both brother and sire. This process of coupling near relatives, which is known as breeding in-and-in, is unquestionably very effectual, and is frequently the only avail-

able source from which breeding-stock can be obtained that possess and transmit the desired quality. But there is always danger that such a course of breeding will result in a loss of constitutional vigor and fertility in the produce, and it should be practiced with great caution. As soon as any constitutional defect or weakness is noticed as the result of breeding in-and-in an infusion of fresh blood must be obtained by resorting to a male or female not closely related, but possessing as nearly as may be the desired quality. It should be borne in mind that defects are quite as liable to be transmitted as good qualities, and while we are fixing a type of superior excellence in one particular we should be careful that we are not, with equal certainty, perpetuating a serious defect.

It is believed by many that breeding in-and-in has a refining tendency—that its effect is in the direction of fineness of texture, lightness of bone, smoothness, evenness and polish, at the expense of robustness, strength, vigor and power; hence, it is one of the most potent of agents in the production of dwarf breeds, and the main reliance of breeders of Bantam fowls and other diminutive races. It is certainly a powerful and invaluable agent in the hands of an intelligent person in the formation or modification of a breed, but can never be successfully followed by general farmers, who must produce hardy, prolific and vigorous animals.

The great number of intermarriages which took place in the royal family of Egypt during the reign of the Ptolemys has occasionally been referred to by the advocates of close in-breeding; and the magnificent personal appearance of these rulers, their close resemblance in form and feature, and especially the widely-famed beauty of countenance and form, as well as the mental vigor displayed by Cleopatra,

the last of the line, have often been quoted as a strong argument against the theory that breeding in-and-in necessarily produces physical deterioration; but a close examination of the line of descent leaves the balance of the argument rather on the other side. Galton, in his "Hereditary Genius," in speaking of this family, says:

> This race of Ptolemys is at first sight exceedingly interesting, on account of the extraordinary number of their close intermarriages. They were matched in-and-in like prize cattle; but these near marriages were unprolific—the inheritance mostly passed through other wives. Indicating the Ptolemys by numbers, according to the order of their succession, II married his niece, and afterwards his sister; IV his sister; VI and VII were brothers, and they both consecutively married the same sister—VII also subsequently married his niece; VIII married two of his own sisters consecutively; XII and XIII were brothers, and both consecutively married their sister, the famous Cleopatra. Thus there are no less than nine cases of close intermarriages distributed among the thirteen Ptolemys. However, when we put them into the form of a genealogical tree we shall clearly see that the main line of descent was untouched by these intermarriages, except in the two cases of III and of VIII. The personal beauty and vigor of Cleopatra, the last of the race, can not therefore be justly quoted in disproof of the evil effects of close breeding. On the contrary, the result of Ptolemaic experience was distinctly to show that intermarriages are followed by sterility.

Galton then proceeds to show that nearly all of these incestuous marriages were unfruitful, the only exceptions being that of Ptolemy II with his niece, from which was produced Ptolemy III, and Ptolemy VII with his niece, the produce being Ptolemy VIII, the grandfather of Cleopatra, the descent in all other cases passing through wives that were not nearly related to this family.*

The testimony of experienced naturalists and of intelli-

* "Hereditary Genius," by Francis Galton, p. 152.

gent and careful observers among practical breeders is uni formly in favor of the proposition that a cross in the blood gives increased size and vigor to the produce. It is an equally well-established fact that cross-breeding, or the pairing of animals of distinct varieties, usually results in increased fertility; but it is rather singular that, while this result usually attends the pairing of distinct varieties of the same species, yet if cross-breeding be carried so far as to unite distinct species, although increased size and vigor are still attained, fertility is almost entirely lost. A familiar illustration is seen in the produce of the horse and the ass. The mule, resulting from such a union, is often larger than either parent, and is noted for its hardiness and powers of endurance, but the power of reproduction is totally wanting. The same is true of most other hybrids. It is a singular fact that a loss of fertility is also one among the very first bad results manifested from long-continued breeding in-and-in—which is the converse or opposite of violent outcrossing; and yet all experience proves this to be true.

The space that can be devoted to a discussion of this branch of the subject will not admit of an elaborate investigation of the principles of genesis by which this apparent contradiction is explained. The majority of my readers are more concerned with *facts* and *results* than with *theories* and philosophical abstractions. But, at the risk of giving more of theory than will be relished, I will venture to state that, in order to produce a sexual union which shall be fruitful, and call into life a new organism, according to the opinion of most scientists, it is essential that the sperm-cell and the germ-cell, which, united, form the source of life to the new being, shall each proceed from a different organism; and that breeding in-and-in, as usually practiced—being the selection of individuals of as nearly as may be a

similar organization, with the avowed purpose of creating uniformity of character—will, in course of time, if not counteracted by opposing influences, produce such a unity of organism in the members of a given family as will result in a loss of that differentiation which appears to be necessary to insure the fusion of the sperm-cell of the one with the germ-cell of the other.

In commenting upon this aspect of genesis, Herbert Spencer says:

> Remembering the fact that among the higher classes of organisms fertilization is always effected by combining the sperm-cell of one individual with the germ-cell of another, and joining with it the fact that among hermaphrodite organisms the germ-cells developed in any individual are usually not fertilized by sperm-cells developed in the same individual, we see reason for thinking that the essential thing in fertilization is the union of specially-fitted portions of *different* organisms. If fertilization depended on the peculiar properties of sperm-cell and germ-cell, as such, then in hermaphrodite organisms it would be a matter of indifference whether the united sperm-cells and germ-cells were those of the same individual or those of different individuals. But the circumstance that there exist in such organisms elaborate appliances for mutual fertilization shows that unlikeness of derivation in the united reproductive centers is the desideratum.*

After explaining at some length the apparent contradiction of this theory which is found in plants that are self-fertilizing, Mr. Spencer further remarks:

> There is reason to believe that self-fertilization, which at the best is comparatively inefficient, loses all efficiency in course of time. After giving an account of the provisions for an occasional, or a frequent, or a constant crossing between flowers, and after quoting Prof. Huxley to the effect that among hermaphrodite animals there is no case in which "the occasional influence of a distinct individual can be shown to be physically impossi-

* "Principles of Biology," Vol. I, p. 279.

ble," Mr. Darwin writes: "From these several considerations, and from the many special facts which I have collected, but which I am not here able to give, I am strongly inclined to suspect that, both in the vegetable and animal kingdoms, an occasional intercross with a distinct individual is a law of nature. * * * In none, as I suspect, can self-fertilization go on for perpetuity." This conclusion, based wholly on observed facts, is just the conclusion to which the foregoing argument points. * * * If, then, in a self-fertilizing organism, and its self-fertilizing descendants, such contrasts as originally existed among the physiological units are progressively obliterated—if, consequently, there can no longer be a segregation of different physiological units in different sperm-cells and germ-cells, self-fertilization will become impossible; step by step the fertility will diminish, and the series will finally die out.*

A similar view of this subject is presented by Mr. Darwin in a letter published in the London *Agricultural Gazette*, of May, 1878, from which I extract the following:

I will venture to add a few remarks on the general question of close interbreeding. Sexual reproduction is so essentially the same in plants and animals that I think we may fairly apply conclusions drawn from the one kingdom to the other. From a long series of experiments on plants, given in my book "On the Effects of Cross and Self-Fertilization," the conclusion seems clear that there is no mysterious evil in the mere fact of the nearest relations breeding together; but that evil follows (independently of inherited disease or weakness) from the circumstance of near relations generally possessing a closely similar constitution. However little we may be able to explain the cause, the facts detailed by me show that the male and female sexual elements must be differentiated to a certain degree, in order to unite properly and to give birth to a vigorous progeny. Such differentiation of the sexual elements follows from the parents and their ancestors having lived during some generations under different conditions of life.

The closest interbreeding does not seem to induce variability, or a departure from the typical form of the race or family, but

* "Principles of Biology," Vol. I, pp. 281, 282.

it causes loss of size, of constitutional vigor in resisting unfavorable influences, and often of fertility. On the other hand, a cross between plants of the same sub-variety, which have been grown during some generations under different conditions, increases to an extraordinary degree the size and vigor of the offspring.

Some kinds of plants bear self-fertilization much better than others; nevertheless it has been proved that these profit greatly by a cross with a fresh stock. So it appears to be with animals, for Short-horn cattle—perhaps all cattle—can withstand close interbreeding with very little injury; but if they could be crossed with a distinct stock without any loss of their excellent qualities, it would be a most surprising fact if the offspring did not also profit in a very high degree in constitutional vigor. If, therefore, anyone chose to risk breeding from an animal which suffered from some inheritable disease or weakness, he would act wisely to look out, not merely for a perfectly sound animal of the other sex, but for one belonging to another strain, which had been bred during several generations at a distant place, under as different conditions, as to soil, climate, etc., as possible, for in this case he might hope that the offspring, by having gained in constitutional vigor, would be enabled to throw off the taint in their blood.

The view of the case presented by Darwin and Herbert Spencer in the foregoing extracts affords an explanation of many apparent contradictions which result from breeding in-and-in. The farmer who *permits* his stock to pair miscellaneously, without infusing fresh blood for many generations—as is the case with some—must necessarily practice breeding in-and-in; but, as in such cases the stock is almost invariably, at the beginning, of a heterogeneous character, it will require a much greater period of time before breeding in-and-in shall have produced a sufficient degree of unity of organism to interfere with fertility or to cause a loss of vitality than in cases where the stock, to begin with, is of a uniform type, or "purely-bred." In such cases, also, there is no effort on the part of the farmer to produce uniformity by selection of individuals for coupling. If there be any

selection at all the standard by which it is made is a capricious one, changing from year to year; and it is a well-known fact that in such hands uniformity of type is never reached, neither have any bad effects usually been observed from in-breeding in such cases.

If the theory above advanced be correct no bad effects will necessarily result from breeding in-and-in until uniformity of type, which implies unity of organism, is attained; and this, as we have seen, when breeding from a mixed stock, is a very slow process.

Upon this aspect of the case Herbert Spencer remarks:

Relations must, on the average of cases, be individuals whose physiological units are more nearly alike than usual. Animals of different varieties must be those whose physiological units are more unlike than usual. In the one case the unlikeness of the units may frequently be insufficient to produce fertilization; or, if sufficient to produce fertilization not sufficient to produce that active molecular change required for vigorous development. In the other case both fertilization and vigorous development will be made probable.

Nor are we without a cause for the irregular manifestation of these general tendencies. The mixed physiological units composing any organism being, as we have seen, more or less segregated in the reproductive centers it throws off, there may arise various results, according to the degrees of difference among the units and the degrees in which the units are segregated. Of two cousins who have married the common grandparents may have had either similar or dissimilar constitutions; and if their constitutions were dissimilar the probability that their married grandchildren will have offspring will be greater than if their constitutions were similar. Or the brothers and sisters from whom these cousins descended, instead of severally inheriting the constitutions of their parents in tolerably equal degrees, may have severally inherited them in very different degrees; in which last case intermarriages among the grandchildren will be less likely to prove infertile. Or the brothers and sisters from whom these cousins descended may severally have married persons very

like or very unlike themselves, and from this cause there may have resulted either an undue likeness or a due unlikeness between the married cousins. These several causes, conspiring and conflicting in endless ways and degrees, will work multiform effects. * * * Hence it may happen that among offspring of nearly-related parents there may be some in which the want of vigor is not marked, and others in which there is decided want of vigor. So that we are alike shown why in-and-in breeding tends to diminish both fertility and vigor, and why the effect can not be a uniform effect, but only an average effect.*

It follows, then, as a practical deduction from the foregoing, that the more purely bred and uniform in type our stock becomes the greater is the danger from breeding in-and-in. That while, as before remarked, it is a powerful agent in the hands of a skillful and intelligent person in the formation of a breed, it must be used with the greatest of caution with animals of a uniform type, and that with miscellaneously-bred stock its evil effects are comparatively slow in showing themselves.

Many who have given the subject of breeding *as a science* only a casual investigation—who have studied only the methods of a Bakewell, a Colling, a Booth, or a Bates, without taking into account the *circumstances under which these methods were practiced*—have hastily adopted the conclusion that what was successful in such hands as theirs must still be correct in practice; that because Bakewell and Colling bred in-and-in to fix a desired type, and by continuing that process for a time succeeded in effecting substantial improvement in their cattle and sheep, it must necessarily follow that the surest method of preserving the excellence attained by them is to continue in precisely the same road. Or, to put it rather more mildly, because in the *formation of a breed* these men experienced little if

*"Principles of Biology," Vol. I, pp. 283 and 284.

any damage from the practice of breeding in-and-in to the extent to which they carried it, modern breeders of thoroughbreds can continue to breed in-and-in with impunity!

There is no one point upon which practical breeders, as well as scientists, are more perfectly agreed than that the ultimate tendency of breeding in-and-in is injurious—that when carried to *excess* it will always result in a loss of constitutional vigor in the produce; that while its tendency may be in the direction of fineness of texture, lightness of bone, smoothness, evenness and polish, it is invariably at the expense of robustness, strength, vigor and power. On the other hand, scientists as well as practical breeders, with perhaps equal unanimity, concur in the belief that a cross in the blood usually gives increased size and vigor to the produce, and that cross-breeding, or the pairing of animals of distinct varieties, usually results in increased fertility.

The belief has largely obtained among practical farmers and feeders that all purely-bred races or breeds are lacking in hardiness and stamina, and that when breeding for the dairy, the shambles or for practical use on the farm the greatest measure of success is attained through the medium of cross-breeding. The first of these assumptions is not necessarily true. When the breeding and management of purely-bred races have been in accordance with Nature's laws there is no foundation for the assertion that they are deficient in hardiness; and the wide-spread belief to the contrary has resulted mainly from the bad effects which inevitably follow long-continued incestuous or in-and-in breeding. That with certain kinds of purely-bred stock this course of breeding has been so extensively practiced as to very greatly impair the vitality of the animals so bred no intelligent, careful observer will deny; while in others, where selection has constantly been made with reference to

hardiness, strength, and endurance—where close in-breeding has been avoided, and where there has been no unnatural forcing and pampering, the pure races or breeds have no peers in these valuable qualities. The lack of hardiness complained of in purely-bred stock is an accident, due to a peculiar course of breeding or treatment, not justly chargeable to the simple fact that the animal is a purely-bred one, and not necessarily following the course of breeding essential to the creation of a thoroughbred. The thoroughbred race-horse, or "blood-horse," as he is often called, the purest and best established of all our breeds of domesticated animals, is a pointed illustration of this fact, and the reason is obvious. With the breeder of the race-horse vitality has always been a paramount consideration, as upon this depends the ability of the horse to last in a long and closely-contested race; hence a course of breeding that had a tendency to impair the vital forces has never found favor with breeders of these horses. None of the practices that have combined to impair the strength and vigor of purely-bred cattle, sheep, or swine, have been resorted to by them. In-breeding and pampering have both been frowned upon. Selection of the stoutest and best specimens of the breed has been the touchstone of their success. Once in and twice out has been as near an approach to in-breeding as has ever found favor among them; hence we find the thoroughbred horse of today the superior of all the other representatives of the equine race in speed and endurance.

It appears evident that if the laws of heredity are as I have here stated—that is: that the tendency of in-breeding with established races or breeds is to weaken the vital forces, and that cross-breeding gives increased vigor and vitality—we have here a lucid explanation of why the general farmer finds it most profitable to raise grade or cross-

bred stock for the dairy or for feeding purposes. The purely-bred races or breeds, as a rule, have been perfected to a wonderful degree in certain qualities; and when the general farmer, desiring to improve his flocks and herds in any of these particulars, procures a purely-bred male to use as a sire, even though such animal may be suffering some of the bad effects of in-breeding himself, the excellence that characterizes the breed to which he belongs, reinforced and reinvigorated by contact with the current of fresh blood that he meets in the farmer's mixed stock, gives a produce of greatly increased value for everthing *except the purposes of reproduction*. All intelligent breeders agree in condemning *close* in-breeding; but they are not agreed as to what *constitutes* close in-breeding. May we not, upon the theory herein advanced, base a rule which will safely govern our practice? With purely-bred stock, or well-established breeds, keep as far from in-breeding as is compatible with uniformity of type and purity of blood. In the formation of a breed from heterogeneous materials use it as the most potent of all agents, without fear of bad results, provided the parents are healthy, vigorous and well formed, until a considerable degree of uniformity has been reached; bearing in mind the cardinal fact that in proportion as unity of form and organism is attained constitutional vigor and fertility is endangered by such a course of breeding. May we not, also, find in this theory an explanation of the well-known fact that in-bred animals which are barren when coupled with each other frequently prove fruitful when united with individuals of a different breed?

THE VALUE OF PEDIGREE.

A pedigree is the genealogy of an animal. As usually understood it consists of the names of the ancestors for a

greater or less number of generations. Its value consists, not so much in the number of generations through which the ancestry can be traced to some distinguished progenitor, as in the *quality* or *character* of the ancestry; and in proportion as we approach the "top" of a pedigree—that is, the immediate progenitors of a given animal—the more important does the character of the ancestry become.

As has been clearly shown in the preceding pages, it is a well-settled fact in breeding that, as a rule, the longer the line of descent in unbroken succession through ancestors uniformly distinguished for unusual excellence the greater is the probability that that peculiar excellence will be transmitted. Hence, as I have before said, the true test of the value of a pedigree is not so much in its length as in the merits of the individuals that compose it. Four or five "top crosses" with animals of rare individual merit make a pedigree of much greater value to the practical breeder than ten, twenty or as many more as you like of animals of no special excellence. The farther back this genealogy of good animals extends, and the more uniform the quality of the ancestry, the better; but the more immediate the ancestry in any given case the more important does its quality become. Each immediate parent contributes one-half of the blood or pedigree inheritance of the individual, while each great-grandam or sire contributes one-eighth only; and the farther the removal the more unimportant does any given factor or cross become for good or evil in a pedigree. However desirable it may be to have a record connecting our horses with Flying Childers, Eclipse or Messenger, and our cattle with Hubback or Favorite, at a distance of ten to twenty generations, it is manifestly of far greater importance to know that our own cattle and horses are good, and that their ancestors for the last four

or five generations were of surpassing excellence. If our own animals are good, and the top crosses have been uniformly of the same character, we may reasonably expect the progeny to be satisfactory; while, on the contrary, if we have no special merit in the sire and dam, or their immediate ancestors, we may show as many lines as we like to some great ancestor ten or fifteen generations removed and it will not wipe out the stain of the defective recent crosses.

No pedigree can be a good one that does not usually produce good animals; no pedigree should be prized above other pedigrees unless it usually produces better animals. If, tried by this test, any pedigree fails, no matter how much it may have been idolized, its value is fictitious and its effect is hurtful rather than beneficial. The only true aristocracy of blood is one that brings superior merit; without this it is a delusion and a snare. No matter what it *may have been* eight or ten generations ago, if from a wrong system of breeding, if from a lack of care in selection, if from incestuous breeding, or from any other cause, any particular strain has ceased to be uniformly superior, in itself, it has lost its patent of nobility. Let all young breeders, and old ones too, for that matter, try "pedigrees," and "families," and "strains" by this test, without being dazed by some imaginary halo that attaches to a name handed down from the misty traditions of the past, and it will be the better for them, no matter what particular line of breeding they may be engaged in.

RELATIVE SIZE OF SIRE AND DAM.

The relative size of sire and dam is a subject upon which much has been written, and upon which I am satisfied there has been much wrong teaching. It is true that

nearly all writers upon the subject have laid down the rule that, in coupling, the male should be smaller than the female; but it is also true that very many persons write dogmatically upon subjects which they know but little about; and it is further true that writers upon heredity, for years and years past, have done little more than to repeat each other, accepting what has been said by others as true without question, not knowing or caring to know anything about the facts in the case. I imbibed the doctrine that the male should be smaller than the female from my early reading upon the subject, and began writing from the same standpoint; but very early in my career as a writer upon stock-breeding my esteemed friend, Judge T. C. Jones, of Ohio, from whom I have taken many valuable lessons, called my attention to the manifest unsoundness of this theory, and said that he was fully convinced that the teaching of the books upon this subject was all wrong, and that, while he did not advocate great disparity in the size of parents, he was satisfied that when there was a difference it should be the reverse of what the books taught—that the sire should, as a rule, be larger than the female. It was a startling proposition to me, but it set me to thinking and watching the subject closely; and now, looking back over more than a quarter of a century of experience, I say emphatically that Nature's plan, as exemplified in all mammalia, is that the male parent shall be the larger of the two. In all animals, from the horse down to the pig, wild as well as tame, the male, as a rule, is larger than the female of the same breed. No observant man can have failed to notice this. What pure breed or race of animals, in any country, can be named as an exception to this rule? And is not this also true of the human race? How many of my readers are there who can call to mind numerous instances of hand-

some, well-formed and robust children the offspring of a large father and a small mother! The same result has been observed in hundreds of other cases where large draft-horses have been coupled with small or medium-sized mares. In fact it is the almost universal testimony of those who have watched closely the result of the cross of the imported draft stallions brought to this country from France and Great Britain, that the very best results have been obtained, not from large, coarse, and loosely-made mares, as theorists would have us suppose would be the case, but from those of medium size, compactly made and highly bred.

The excellent results obtained by crossing bulls of the large breeds upon our small, native cows—also the health, vigor, and fine form of the lambs got by large Cotswold rams out of small ewes of the Merino breed, all go to prove that this supposed law of nature is no law at all. In fact, if we study Nature, we shall be compelled to admit that her law is just the reverse of what has been claimed; for, with scarcely an exception, through all the stages of animal life, the males of any given species, race or breed are larger than the females. It is, therefore, safe to assume that the results are more likely to be satisfactory where large males and small females are coupled for breeding purposes than where the reverse is the method practiced.

I would not recommend, neither does it follow as a legitimate deduction from this general law, that *great* extremes of size should be coupled. In fact, nature has herself interposed many obstacles to prevent such a course of breeding.

There is not, as has often been alleged, any increased danger in parturition from the use of sires larger than the dams. It is the dam that determines the size and growth of

the fœtus, and not the sire. Wrong presentations, faulty construction of some parts of the organs of generation or of the pelvic bones of the female, an emaciated or too plethoric condition of the dam at the time of parturition, an unnatural or deformed fœtus, are the usual causes of difficult parturition, and these conditions are brought about independent of the relative size of sire and dam.

It goes for nothing to say that improvement in any breed has resulted from the use of males of a smaller breed upon females of a larger. If one desires to bring about improvement in any direction he must select with a view to that quality, independent of other considerations. Were I desirous of improving the butter-producing quality of the Holstein cow I should use a Jersey bull, notwithstanding the male might be smaller than the female. I would couple large, coarse-wooled ewes with a Merino ram if I desired to increase the density of the fleece; and I would breed large draft-mares to thoroughbred or trotting sires if I desired to procure fine style, better action and greater powers of endurance. But all of this is independent of, and does not conflict with, the general law of relative size, and does not disprove the proposition that it is nature's plan that the male should be the larger of the two parents.

INFLUENCE OF FIRST IMPREGNATION.

One of the most interesting as well as one of the most stoutly-disputed questions connected with the business of stock-breeding is this: Does the first impregnation of a female have any influence over the character of the produce from subsequent impregnations? Experienced practical breeders have been arrayed on opposing sides in discussing this question, and each has been ready to maintain his position by illustrations from his own observation. Prof.

James Law, of Cornell University, who is one of the most learned and eminent of living veterinarians, and whose reputation as a patient, conscientious, painstaking investigator of problems of this nature is second to that of no other man in the world, was requested by me some years ago to prepare an exhaustive article upon this subject. He complied with this request, and the article, which was published at the time in a monthly journal which was then under my charge, I herewith reproduce as the most thorough treatise upon this interesting subject I have yet seen:

Physiologists and breeders have long noticed that the influence of the sire is not always confined to his immediate offspring, but that the subsequent progeny of the same female by other males often reproduce in a remarkable manner the personal traits of the first sire and his produce. All quadrupeds show this tendency in a greater or less degree.

We find the statement made by the immortal Haller: that where a mare had borne a mule by an ass and afterwards a foal by a horse, the foal exhibited traces of the ass. The same thing has been noticed by Becker, Haussman, Low and others. Lord Moreton bred a hybrid between a young chestnut mare (seven-eighths Arabian) and a quagga. The hybrid had the bristly mane, striped body and large head of its sire. One and two years later this mare was covered by a black Arabian horse, and the resulting foals had the erect, short, bristly mane, the dun color, and the stripes on neck, body and limbs of the quagga. A third foal, produced two years later, got by the same Arabian horse, still showed the same marks of the quagga. This case is all the more striking that the mane of the Arab is especially soft and silky and lies flat on the side of the neck, and that the Arabian horse has never been known to show a striped marking of the body. A case entirely similar is recorded by Harvey. A mare of Sir Gore Ouseley's was bred to a zebra, producing a hybrid, and in the two succeeding years was put to two thoroughbred horses, but the foals in both cases were striped and partook of the character of the zebra. In the Royal Stud at Hampton Court

a number of mares were bred to the horse Colonel, and the following year to the horse Actæon, but the progeny of the last horse bore unequivocal marks of the horse Colonel, the sire of their half-brothers and sisters. Again, a colt belonging to Earl of Suffield, got by Laurel, strongly resembled the horse Camel by which his dam had had a foal the preceding year.

McGillivray records the following cases: A polled Angus heifer bore her first calf to a Short-horn bull, and was then served by a black polled Angus bull; but the calf resulting from the last connection approached the Short-horn bull in color and shape, and grew horns. Another polled Angus cow was served by a cross-bred bull (one-fourth polled Angus, three-fourths Short-horn) and bore a cross. Next year, though served by a pure black polled Angus bull, the result was still a cross, as shown by shape and color.

Dr. Wells, of Grenada, put a flock of white ewes to a chocolate-colored, hairy ram, and the following year to a white ram of their own breed, and yet the lambs got by the last had the fleece more or less of a chocolate hue and largely mixed with hair. Mr. Shaw, of Leochel Cushnie, Aberdeen, divided his flock of black-faced Highland ewes, and had one part served by a Leicester ram and the other by a Southdown. The next year he had all served by a ram of their own race, but the lambs showed the persistent influence of the English rams in their hornless heads and brownish faces. Again, in the following year, they were served by a pure black-faced ram and there still resulted two hornless lambs, two dun-faced, with very small horns, and three white-faced, with horns quite rudimentary.

Mr. Giles put a black-and-white Essex sow to a wild boar of a deep chestnut color, and obtained a crossed litter, with the color of the wild boar predominating in several. After the wild boar had been some time dead this sow was put to a black-and-white boar of her own breed and produced a litter of pigs, some of which were distinctly marked with chestnut. A second litter, by a boar of her own breed, again showed the chestnut markings, which had hitherto been unknown in the pure Essex.

Among dog-fanciers it is a matter of notoriety that an entire litter of pure-bred puppies can not be expected from a thoroughbred bitch which has once been lined by a dog of another breed. This was noted by the French poet Jacques Savary as

early as the middle of the 17th century, and is confirmed by writers on dogs generally. I will quote but one example from Harvey: A pure Skye terrier, of a dark brown color, with red legs, bore two litters of puppies to a mongrel cur, all of which were colored like the sire—black, with red legs and white feet. On the third occasion she was lined by a pure Skye terrier, of a grey color; and, to avoid accidents, was locked up with this dog during the whole continuance of the heat. The issue was two puppies closely resembling the mongrel cur in color, shape and general appearance. Instances of the same kind have fallen under the observation of almost every dog-fancier.

Many have sought to explain the phenomenon as a simple result of the strong impression made upon the mind of the dam by the sire of her earlier offspring; and, doubtless, this may sometimes co-operate, but is altogether inadequate to account for the frequency of the occurrence. The imagination affects the progeny of a very limited number of females, whereas the phenomenon we are considering—among the domestic quadrupeds—is the rule rather than the exception, so that a more satisfactory cause must be sought for.

McGillivray advances the theory that the elements from the blood of the fœtus, absorbed into that of the mother, *contaminate* her blood, and reduce her to a *cross,* thus rendering her forever after incapable of producing a pure-bred offspring. Not that he supposes the blood of the fœtus, as such, to circulate within the veins of the mother, but that fine particles from the blood of the offspring pass through the intervening layers of cells, and thus reach the maternal blood and reproduce themselves there. But the whole theory is an assumption. We know that the placenta, or after-birth, by which the fœtus is connected with the mother, serves the purposes of both stomach and lungs. From the glands in the walls of the womb a milk-like liquid is constantly secreted, which, being absorbed by the fœtal vessels branching in the placenta, is carried into the blood of the young animal and serves to nourish it, just as the milk from the udder does after birth. Again, from the blood of the offspring circulating in the placenta carbonic acid is given off and taken into the maternal blood, while oxygen supplied by the blood of the dam is taken up by the blood of the fœtus. So far these membranes fulfill the functions of stomach and lungs to the young animal.

But we have no proof of living particles from the blood of the fœtus entering the circulation of the mother, unless we accept as such the very phenomenon we are endeavoring to find an explanation for; and this would only be admissible if no other or more reasonable explanation could be found.

A slight modification of McGillivray's theory is that of Darwin, advanced in his doctrine of *pangenesis*. He teaches that throughout the blood and system of every animal there are living particles, infinitesimally minute, but with certain plastic or formative powers, by virtue of which they can build up particular forms or produce peculiar characteristics in the animal economy. That such particles may remain dormant for months or years, or even for a number of successive generations of animals, being, meanwhile, transmitted from parent to offspring through the microscopic ovum and spermatozoon, and will only be roused to activity and growth and build up the forms and beings, like those from which they were derived, when there occurs a change of circumstances favorable to their development. By this means he explains many cases of apparent "sports," or variations from the type of the known ancestors; many sudden advances in excellence and retrogressions.

As applied to the phenomenon under consideration it is taught that these infinitesimal particles (gemmules), passing through the membranes from the blood of the fœtus into that of the mother, circulate with it, affecting the ovarium of the female, so that the ovules and offspring subsequently produced by her when impregnated by other males are plainly affected and hybridized by the first male.

It will be readily conceded that such particles circulating in the blood of the mother will be much less likely to affect her own system, already matured, insusceptible and undergoing the changes of nutrition only, than the growing elements of the ovum or the tissues of the embryo in active process of growth, and with a power of development equal in some cases to the reproduction of an organ accidentally lost. Much, indeed, might be said in favor of the theory; yet, as in its less elaborate form propounded by McGillivray, it is founded on pure assumption and supported by no clear proof. The gradual extinction of the influence of the first male in successive pregnancies by other males is what would scarcely be expected if the blood was

charged with gemmules from the first capable of reproducing themselves and especially prone to rapid increase and development in connection with the development of offspring. Again, similar elements must be introduced into the maternal blood when the vital fluid has been transfused into her veins from those of another person or of a beast, and the ovules then in course of development in her ovaries must be "affected and hybridized" if such blood is not exactly identical in composition with her own. But though transfusion of blood into the female system is not uncommon, and though that blood has been repeatedly taken from a person of a widely different race, no complaint has ever been made that the children have been thereby affected.

A more satisfactory explanation is that advanced by the present writer, in a paper read, in 1875, before the American Public Health Association:

> It is a well-known pathological fact that adjacent cells tend to engraft their plastic or formative powers upon each other. I prick my skin with a needle. Immediately the injured cells and nuclei undergo a rapid increase in size and numbers. But the effect does not end there; those adjacent take on a similar action, and the extent of the resulting inflammation is only limited by that of the injury and the susceptibility of the parts. Again, in placing a slice of scarf skin in the middle of a raw sore we inoculate the cells of the adjoining granulations and empower them to develop scarf skin. How, then, can we avoid the conclusion that the impregnated ovum impresses its own characters on the mass of the decidua, and through this on the maternal mucous membrane, and that this in its turn impresses its characters on the membrane and embryo of the next succeeding conception?

It has been opposed to the theory of *contamination of the mother's blood*, that in the case of woman the father of the first child rarely affects the appearance of those by other fathers. Mr. Allen has known instances in which white women had their first children by negroes, and afterward marrying white men had children as purely white as those of their neighbors. Instances in which an opposite result has ensued he attributes to the effect of imagination. Now, the theory I offer will perfectly explain the infrequency of the occurrence in the human subject, as compared with the lower animals. In the mare the connection of the after-birth with the womb takes place over the entire surface of the latter. The points of intimate attachment, therefore, in successive pregnancies, are the same. In the cow and

ewe the womb is studded with button-like processes, to the number of fifty or sixty, containing the uterine gland, and forming the points of attachment for the fœtal membranes in all pregnancies alike. In the sow the fœtal membranes of each pig are attached to the whole adjacent uterine mucous membrane, as in the mare. Lastly, in the bitch each fœtal membrane has a broad, circular, villous belt embracing almost its entire surface, and connecting it to the mucous membrane of the womb. In all of these animals the fœtal membranes are connected with the same parts of the uterus in each successive pregnancy, so that the ingrafting or inoculation between membranes and womb, and between womb and membranes and fœtus, can not fail to take place. It must be borne in mind that these membranes are outgrowths from the ovum or embryo, and thus, through the male and female generative elements, partake of the nature of both sire and dam. In other words, like the young animal, the product of conceptions of which they are a dependency, the membranes have been produced by the union of the male and female elements; and where they lie in direct contact with the womb, separated only by a thin layer of cells in part produced by the womb and in part by the membrane, an inoculating, engrafting or modifying action is effected by the one on the other. In woman the arrangement of the fœtal membranes is altogether different. Their intimate connection with the walls of the womb is confined to one circumscribed portion of the surface of each; and as the point of attachment can hardly fail to be different in successive pregnancies, the chances of a former child influencing the characters of the next are correspondingly reduced. Yet it is evident that this may occur, and, as a matter of fact, we find cases in which the bearing of a mulatto by a white woman has affected the appearance of some of her later children by a white man. But such a result is very exceptional in the human family, and this is precisely what is to be expected if our explanation of its cause is the right one.

It has been objected that a similar phenomenon has been observed in pigeons, and that in them this law of cell-inoculation could not take place. But this is, manifestly, a mistake. The eggs of birds are impregnated even as high up as the ovary. Says Owen: "In *coitu* spermatozoa enter the cloaca and penetrate the oviduct, ascending to the ovarium." The impregnated

egg goes on enlarging by subdivision of its cells in the ovary and upper end of the oviduct, and, being as yet destitute of shell, its cellular structure is in direct contact with the maternal tissues. There is, therefore, a similar opportunity for cell-inoculation as in the mammal, although more limited in duration.

But our manner of viewing this subject is still further supported by a series of phenomena observed in hybridized flowers. Darwin quotes instances from Wiegmann, Gartner, Berkley, and others, to show that where the flowers of the white pea had been fertilized by pollen of the blue pea the resulting pods contained a mixture of blue and white peas. And this coloration was not confined to the cotyledons of the seed (the true embryo), but extended to the skin as well. More remarkable still: Mr. Laxton, of Stamford, "fertilized the tall sugar pea, which bears very thin, green pods, becoming purplish-brown when dry, with pollen of the purple-podded pea, which, as its name expresses, has dark, purple pods with thick skin, becoming pale, reddish-purple when dry."

Mr. Laxton has "cultivated the tall sugar pea during twenty years, and has never seen nor heard of it producing a purple pod; nevertheless, a flower fertilized by pollen from the purple pod yielded a pod clouded with purplish red, which Mr. Laxton kindly gave to me. A space of about two inches in length, near the extremity of the pod, and a smaller space near the stalk were thus colored. On comparing the color with that of the purple pod, both pods having been first dried and then soaked in water, it was found to be identically the same; and in both the color was confined to the skin lying immediately beneath the outer skin of the pod."

Some of the peas were also clouded with purple, whereas the tall sugar pea is a pale, greenish brown—never purple. Darwin collects a number of other instances in which the fruit or seed capsule was affected by fertilization with strange pollen, in the case of stocks, palms, oranges, lemons, cucumbers, maize, daffodills, rhododendrons, cress and apples. Perhaps the latter furnish the most important examples. "The fruit here consists of the lower part of the calyx, and of the upper part of the flower-peduncle in a metamorphosed condition, so that the effort of the foreign pollen has extended even beyond the limits of the ovarium. Cases of apples thus affected were recorded by Bradley in

the early part of the last century; and other cases are given in old volumes of the 'Philosophical Transactions.' In one of these a russeting apple and an adjoining kind mutually affected each others' fruits; and in another case, a smooth apple affected a rough-coated kind. Another instance has been given of two very different apple trees growing close to each other, which bore fruit resembling each other, but only on the adjoining branches. It is, however, almost superfluous to adduce these or other cases after that of the St. Valery apple, which, from the abortion of the stamens, does not produce pollen, but, being annually fertilized by the girls of the neighborhood, with pollen of many kinds, bears fruit differing from each other in size, flavor and color, but resembling in character the hermaphrodite kinds by which they have been fertilized."

Mr. Darwin evidently sees that his system would demand that the gemmules from the strange pollen should serve to fertilize or modify other and distant flowers and buds then being formed on the same tree, for he remarks: "There is not the least reason to believe that a branch which has borne seed or fruit directly modified by foreign pollen is itself affected so as subsequently to produce modified buds; such an occurrence, from the temporary connection of the flower with the stem, would be hardly possible."

Yet, if the gemmules were given off by the pollen it would be quite reasonable to expect such to be carried on with the descending sap, and to modify the buds then in process of formation, as they are represented to do the ovules in the female ovary. But, as in the case of the blood, so in that of the vegetable sap—we have no evidence that it contains particles possessed of plastic powers equal to the development of tissue. This is effected only by the nuclei or cells present in the substance of the tissues themselves; and as these nuclei communicate or are continuous with each other through minute branching processes, they easily affect those immediately adjacent, but have comparatively no influence upon those that are somewhat remote. The modification, therefore, of the fruit capsule, pod, fleshy drupe and fruit stalk surrounding the seed, is only what is to be expected from the contact of the male pollen with the cells of the female flower, and of these in their turn with those adjacent, while all other parts of the plant are entirely unaffected by the act. In the animal the process is identical in every respect; the continuous cells—mater-

nal and fœtal—rendered continuous or placed in direct opposition with each other through their minute branching processes mutually influence the vital processes and formative powers of each other, and thus it comes that the nuclei of the womb, but one step removed from its contained embryo, acquire certain new characters from it, and in due time transmit these to later progeny. The efficiency of this new inoculating process will, of course, be greatest where the vascular connection is the most intimate; and, as we have seen, the effect on the progeny is most patent when these points of intimate vascular connection between mother and offspring are the same in successive pregnancies.

A correct view of this subject is of more practical importance than may at first sight appear, for, although the animal modified by the influence of the sire of an elder half-brother is necessarily a cross, whatever the mode of exerting such influence, an important question may arise regarding the purity of other offspring that bear no evidence of having been subjected to such modifying cause. If Mr. Darwin's theory is correct, that the whole blood of the mother is charged with gemmules from the embryo, which gemmules pass into all future ova, then all future offspring are essentially crosses, as will appear in their progeny, even if they themselves show no sign of modification. But, on the other hand, if the result is only due to the mutual influence of adjacent cells in the womb and fœtal membranes, as vegetable as well as animal physiology seem to imply, then the general system of the dam is unaffected, and her progeny, which have personally escaped such influence and show none of the modified characters, may be held to be of pure lineage, and may be bred from without fear of degraded offspring.

While there are many instances in history which go to confirm this theory, as presented by Prof. Law, yet I am inclined to the opinion, from long years of close observation, that the cases where the first impregnation of mammals affects the subsequent progeny are so rare as to make it practically of but little account in the calculation of the breeder. Indeed the cases where such resemblances are noticed in horses, cattle, sheep and swine are so few and obscure as to lead me rather to the conclusion that they are

accidental, or owing to an inherited similarity in the remote ancestry, rather than to some occult influence exercised by a first impregnation. The case of Lord Moreton's mare and the quagga foal has been pressed into service by every man who has written upon this subject within the last half century, and yet it proves nothing. The black stripe is a distinguishing mark that belonged to the feral dun horses in general, and which to this day occasionally crops out in *all* breeds of horses. And if the influence were as potent as some writers have claimed, especially when applied to the breeding of horses, it is time some more modern case might be cited. Hundreds upon hundreds of excellent mares, many of them thoroughbreds, in Kentucky and Tennessee, have produced their first foals to a jack and have afterwards produced beautiful offspring from highly-bred sires. I can recall many illustrations upon this point that have come under my own observation. In fact the whole theory of gestation, the manner in which the fœtus is attached to and nourished by the womb of the female, seems to make the commingling of the blood of the latter with that of the former an impossibility. In the case of the bitch there is a marked difference from all other domestic animals in the manner in which the placenta is attached to the womb—as is very clearly shown by Prof. Law in the foregoing article—and here alone, among domestic animals, do we find any considerable number of results which tend to confirm the theory that a first impregnation affects subsequent ones. It is noticed so frequently, however, here, that dog fanciers almost universally recognize it as a rule, and exercise the greatest possible care lest a bitch should first be lined by a mongrel or a dog of some other breed. But aside from this single exception I do not think the cases are sufficiently well authenticated or sufficiently numerous to justify the

practical breeder in paying any especial attention to it, especially when to do so would require a departure from plans that would otherwise be followed.

EFFECT OF IMAGINATION UPON THE COLOR OF PROGENY.

The question has frequently been asked, Does a sudden fright, or any peculiarities of association in a pregnant animal, have any effect upon the color or markings of the progeny? and the answer given has sometimes been "yes," and sometimes "no." In fact *both* sides of the question have been stoutly maintained by intelligent gentlemen, who have claimed to speak from extensive personal observation and experience. Ever since the days when Moses wrote the account of the method employed by Jacob to over-reach his father-in-law in the division of his cattle (see Genesis, chap. XXX), there have been those who believed it possible, through a strong mental impression, to affect the color and otherwise mark the offspring; and ever since the day when I, then in my early boyhood, first read the account of Jacob's success in breeding cattle that were "ring-streaked, speckled and spotted," I have been on the lookout for evidence bearing upon the old patriarch's theory.

The result of these observations has been to confirm me in the belief that, while color, as well as all other peculiarities, *usually* follows the ordinary laws of heredity, it is nevertheless true that strong mental impressions do *sometimes* set aside the ordinary laws of Nature and produce surprising results. One very clearly-defined case came under my observation when a lad on my father's farm. A flock of sheep had been bred on this farm, without any infusion of fresh blood, for many years. Not a black sheep, nor one with a black spot or mottled face, had ever been known among them. On one occasion, after most of the

ewes had been bred, a black ram was turned into a small lot with them. Had a strange dog, a wolf, or any other wild animal, been suddenly let down among them they could not have been more terribly frightened. They circled round and round the lot, and made the most frantic efforts to escape from the supposed monster, while he kept turning round and round in the center of the circle, in vain trying to approach the ewes, that seemed almost ready to die with fright. This was kept up until from sheer exhaustion the ewes began to slacken their pace; but it was a long time before the flock became reconciled to the presence of the stranger. Now what was the result? *Every ewe that was pregnant at the time of this fright dropped offspring more or less marked with black*, while *some* of those that were served by this ram a few weeks later, after they had become accustomed to his presence, dropped lambs that were pure white. The case attracted much attention in the neighborhood at the time, and has often been referred to since as a convincing illustration of the effects of color-marking from severe fright.

Other instances have come under my observation; none of them so convincing as the one above narrated, but showing unmistakably the effect of imagination or association. I once knew a grey mare that was bred to a grey Percheron horse for four years in succession, and produced four foals. During her first impregnation she had for a stable companion and working-mate a bay mare, and the foal was a bay. The next year her mate was a chestnut and the foal was a chestnut. Afterwards she was worked and kept with several different animals, of various colors, and her foals were all greys, like herself and the sire.

These cases, with many others of a similar character, that have come under my own observation, as well as hun-

dreds that have been noted by others and reported to me, have, as before stated, confirmed me in the belief that "markings" do *sometimes* occur from strong mental impressions; but the precise conditions under which this phenomenon takes places are unknown. The effect is so uncertain that, practically, it may be entirely ignored by the breeder with impunity, until some modern Jacob shall arise who can tell us just how and when to use the "peeled rods."

EFFECT OF CHANGE OF CLIMATE ON THE GENERATIVE ORGANS.

It has often been remarked that a change of climate appears at times to have a serious effect upon the organs of reproduction, especially those of the male. A well-informed writer in an English journal not long since stated that experience had taught him that no water-fowl will breed the same year that its home is changed, referring, I presume by the context, to a material change as to distance or climatic conditions. I have noticed the same result with quadrupeds, more especially with horses imported from France, England and Scotland. Several horses that, within my knowledge, have totally or partially failed to get foals for a year or two after importation, have, after becoming thoroughly acclimated, proved themselves very sure foal getters. I have also had many cases of a similar nature reported to me concerning bulls of the various breeds, and a still greater number, perhaps, of rams and boars.

It is quite reasonable to suppose that a material change in climate, or even in the mode of feeding, may so derange the organs of reproduction as to cause partial or total loss of sexual power. We know that a change in climate, or even in food or water, often completely upsets a race-horse; and that they are never considered fit to do themselves

credit upon the turf when taken from this country to England, and *vice versa*, short of a year's acclimatization. It is not strange, therefore, that the effect should be equally as marked upon the generative organs as upon the motor apparatus, and upon cattle, sheep and swine as upon horses. And breeders should not be in too great haste to declare an animal a non-breeder under such circumstances. Ample time should be given for thorough acclimatization in all cases of this nature.

CONTROLLING THE SEX.

It has been said that there is nothing new under the sun, and that each succeeding generation spends most of its time in shoveling over the same earth that has been examined in vain by its predecessors in search of hidden treasures. Theories that have been advanced, investigated and abandoned, come up again year after year to be discussed, investigated and again cast aside as unreliable. They appear periodically; and the lapse of a decade is sufficient to pass in review, through the agricultural press, the whole brood upon any given subject bearing upon agriculture. That of controlling the sex of offspring has, ever since the days of Aristotle, been one of the most fruitful topics of discussion, and the various theories that have been advanced appear and reappear with perennial vigor. These theories may be briefly summarized as follows:

1st. A strong mental impression on the part of the parents, but especially of the mother, at the time of conception, will determine the offspring.

2d. The concentration of the attention of the dam on her peculiarly feminine qualities, at the time of sexual union, will secure female progeny.

3d. If the amorous desires of the male are stronger than those of the female the progeny will be a female, and *vice versa*.

4th. The development of the fœtus in the right side (horn) of the womb will secure a male, and in the left side a female.

5th. The point of origin of the artery of the testicle from the main abdominal trunk (aorta) will determine the sex of the majority of the offspring, the male sex predominating in proportion as the origin is more anterior.

6th. The male germ is supplied by the right testicle or ovary, and the female by the left.

7th. The excitation of one side or the other of the system of the male at the time of coition will determine the sex of the young.

8th. The persistent selection for breeding purposes of females which yield one sex mainly, and of males from females of the same kind, will finally secure a race producing a great excess of the sex in question.

9th. In uniparous animals every successive ovum that reaches maturation is of the opposite sex from that which immediately preceded it. Hence, by serving on the second occurrence of heat we may secure the same sex as in the last fœtus.

10th. The stage of development attained by the ovum at the period of impregnation determines the sex of the product of fecundation, the less developed proving females, the more mature males.

11th. The personal preponderance in strength and vigor of the one parent will determine an excess of its own sex in the progeny.

12th. The nature of the food of the parents, and particularly of the mother before conception, will influence the production of the different sexes.

Several other theories have been advanced, but the foregoing includes the principal ones. It may be that several of these causes have some influence in determining the sex, but it is quite certain that some of them, notably the 4th, 6th and 7th, can have no influence whatever, and that none of them can be depended upon. Nature has wisely provided, in order to preserve an equilibrium in the sexes, that their determination should be placed beyond the control of any single cause. It is known that some males get a large preponderance of one sex or the other, and some females

will produce one sex only; sometimes for a series of years the observation of one man will tend to confirm a certain theory of sex production, while in other hands the same theory will utterly fail. It may be that we shall ultimately discover the circumstances under which these various causes operate upon each other, so that we shall be able, in many cases, to produce a given sex at will, but at present we know but little if any more upon the subject than was known to our grandfathers.

The theory that just now appears to be more generally believed in than any other, is the 9th in the foregoing list. This is based on the belief that, naturally, animals which usually bring forth but one at a birth will produce the sexes alternately—that if the first ovum produces a male, the next ovum, if impregnated, will produce a female; consequently, if a cow or mare, after having produced a female, is impregnated at the first period of heat thereafter, the produce will be a male. If female produce only is desired, one period of heat should elapse after the birth of a female before the dam is again served by the male. This is what has been known as the Stuyvesant theory, and many cattle-breeders of my acquaintance firmly believe that it can be relied upon in a majority of cases.

CHAPTER II.

THE BREEDS OF HORSES.

THOROUGHBREDS.

In undertaking to write upon the breeds of horses we very naturally commence with the thoroughbred, because that is the oldest and best established of the breeds of Europe and America. The term thoroughbred, often used in America, but seldom in England, as a synonym for well-bred or purely-bred, was originally used exclusively as the name by which the English race-horse was designated. The same horses are sometimes denominated "blood horses," from the well-established purity of their lineage.

The thoroughbred horse is peculiarly a British production. At a very early period the attention of the rulers of Great Britain was earnestly directed to the work of improving the breeds of horses of that kingdom. These horses were notoriously deficient in size, and the earliest efforts were directed towards improvement in that particular by the importation of heavy horses from Normandy, Flanders and Germany. It would be interesting to trace, step by step, these efforts, but our space will not admit of such detail. The era of improvement commenced with the conquest of the islands by the Saxons; but it was many years before there appears to have been any clearly-defined or well-settled purpose, the object at one time appearing to be an increase of size by large importations of the heavy horses

of Flanders, and again, to give gracefulness of motion and beauty of form, by the introduction of what is known as Oriental blood—that of the Arab, the Turk and the Barb. It is evident that from a very early period the blood of the Barb and of the Turk was held in higher esteem than that of the Arab, the latter being regarded as undersized, and to be esteemed rather for beauty of form and graceful action than on account of any real superiority.

For several years preceding the reign of Charles II, horse-racing appears to have been rapidly growing into favor as an amusement and recreation among the English people; and from that time until the present, contests for supremacy upon the turf have stirred the British heart as no other amusement has ever done. To the constant growth and great popularity of this sport, which for nearly two hundred years has been regarded as the national amusement of that country, are we indebted for persistence in a course of breeding which has given us this race of horses so pre-eminently distinguished throughout the world for speed and endurance upon the race-course; and which, on account of the great care taken in their breeding, and their consequent purity of lineage, were the first race of animals to which the term *thoroughbred* was applied.

The foundation upon which this now well-established breed was built was a promiscuous mingling of the native horses of the Island of Great Britain—first with the larger races of Europe, especially of Normandy, Flanders and Germany, and subsequently with the lighter, more agile and graceful horses of Spain, which were themselves almost identical with the Barbs on the other side of the Mediterranean. Frequent importations were also made direct from Egypt, Morocco and Tunis, and likewise from Arabia and various parts of Turkey, until this Oriental blood, to a con-

siderable extent, permeated all the horse stock of Great Britain, excepting those bred especially for agricultural purposes. So thoroughly had the passion for turf sports, or horse-racing, taken possession of the English people as early as the reign of Charles II, that ability to run and win in a race was even then regarded as the principal test of merit in horses, and those most successful on the turf were most highly prized for breeding purposes. From that time down to the present, embracing a period of more than two hundred years, the selection of breeding stock has been constantly made with this as the primary object.

With the advent of Charles II, in the last half of the seventeenth century, breeding for speed and endurance upon the race-course began to be conducted on something like a definite plan; the records of turf performances were carefully kept, especial attention was paid to the pedigrees of horses designed for the turf; and an aristocracy of blood came to be recognized in the horses of England. This monarch sent his "master of the horse" to the Levant for the purpose of procuring horses for breeding purposes, with which he proposed to found a breeding stud. His purchase comprised three very famous Turkish stallions and some mares that, in the equine literature of the day, were called the "royal mares," and these royal mares are by many supposed to be the foundation of the strict thoroughbred. This origin is, however, more mythical than real, as it is well known that several other mares were, from time to time, introduced from the Orient, and that the produce of many mares, not descended from nor related to these royal mares, have been distinguished upon the turf and recognized as thoroughbreds.

About the middle of the eighteenth century, one hundred and thirty-five years ago, the publication of the English

Racing Calendar was commenced. In this the names of all the horses that participated in the regular races were published, and in a very few years it became the custom to give also the name of the sire in each case. This publication has been continued, with very little change in form or matter, down to the present day, and the records of performances and names of performers therein contained furnished the basis for the stud book. A collection embracing all the pedigrees of distinguished horses that could be obtained was published as early as 1786. Subsequent to this several attempts at a compilation of pedigrees from the Racing Calendar and other sources was made, but it was not until 1791 that the English Stud Book took its present form.

The standard of admission to the first volume of the Stud Book appears to have been simply creditable performance upon the turf, as shown by the Racing Calendar, it being taken for granted that no horse could be a creditable performer that was not well bred—an assumption that has never yet been found at fault. The first volume compiled upon this basis has furnished the foundation for all subsequent ones, and few names have been admitted to registry that do not trace, without admixture, on both sides, to an ancestry that is recorded in the first volume, or to subsequent importations of Oriental blood.

Prof. Low, in his great work upon the "Domesticated Animals of Great Britain," in commenting upon the various importations of foreign blood that went to make up the foundation for the English blood horse, says :

> The lighter horses for speed, introduced previous to the reign of James I, were Spaniards, Barbs and Turks. But King James, on his accession to the English crown, resolved to try the Arabian, with which his reading had probably rendered him familiar. He

purchased a horse of that race, imported from the east by an English merchant, Mr. Markham, for which he paid the sum, great in those days, of £500. This horse, however, in no way distinguished on the turf or for his stock, attracted little attention. The Duke of Newcastle, who afterward wrote a remarkable work on horses, took an especial dislike to this Arabian, abused him as a bony creature, good for nothing, because being trained to the course he could not run. This opinion seems to have exercised a great influence on the breeders for the turf, and it was not until after the lapse of more than a hundred years that the neglected Arabian was again resorted to. During this long period Barbs and Turks from the Levant were the horses chiefly imported and mingled in blood with the pre-existing race.

Of the foreign horses early introduced into England, one familiarly known as the White Turk was the property of Mr. Place, the stud groom of the Lord Protector Cromwell. Another was brought by the Duke of Berwick from the siege of Budy in the reign of James II; and a third, the Byerly Turk, became the most distinguished of all the foreign horses of that period. He was the charger of Capt. Byerly in the wars of William in Ireland about the year 1689. Of the lineal descendants of this horse one was King Herod, born in 1758, bred by his royal highness William, Duke of Cumberland, brother of George II. This fine horse, on retiring from the turf, was employed as a stallion, and got 497 winners at our various race-courses, computed to have gained to their owners £201,505.

In the latter years of Queen Anne an Arabian had been brought to England which tended to impress a new character on the English turf. This animal, the progenitor of some of the finest horses that have perhaps existed in the world, was purchased at Aleppo by a merchant, the brother of Mr. Darley of Yorkshire. He was supposed to have been of the Desert breed, although his precise lineage was not determined. He got the Devonshire or Flying Childers and another horse termed Bartlett's Childers, who was never trained, but who was the ancestor of Eclipse, one of the most remarkable horses of which we have any record.

The Devonshire, or Flying Childers, born in 1715, was so named from his breeder, Mr. Leonard Childers, of Carr House, near Doncaster, from whom he was purchased when young by the Duke of Devonshire. He was a chestnut horse, with four white legs.

He was of noble form, of matchless courage, and the fleetest horse that had ever been upon the English turf.

Eclipse was got by Marske, a grandson of Bartlett's Childers, out of Spiletta. He was foaled in the year 1764, during the eclipse of that year, from which circumstance he took his name. He was bred by the Duke of Cumberland, and, on the death of that prince, sold to Mr. Wildman, a salesman at Smithfield; and afterwards he became the property of Mr. O'Kelly. Eclipse had not the grandeur of form of the Flying Childers, and might have escaped notice but for the accidental trial of his stupendous powers. He was about fifteen hands and one inch high. His shoulders were very low, oblique, and so thick above that, according to the observation of the time, a firkin of butter might have rested upon them. He stood very high behind, a conformation suited to his great power of progression. He was so thick-winded as to be heard blowing at a considerable distance. In the language of honest John Lawrence: "He puffed and blowed like an otter, and galloped as wide as a barn-door." No sooner were his powers exhibited on the turf than every eye was set to scrutinize his form, and he was then admitted to possess in perfection the external characters indicative of great speed. A volume was written on his proportions by M. Saintbel, a veterinary surgeon, whose investigations showed that his figure differed greatly from the conventional form which speculative writers had assigned as the standard of perfection. He was of an indomitable temper, and his jockeys found it in vain to attempt to hold him, but contented themselves with remaining still on the saddle while he swept along, his nose almost touching the ground. His full speed was not determined, since he never met with an opponent sufficiently fleet to put it to the proof. He not only was never beaten, but he was able to distance some of the best horses of his time; and the fleetest could not keep by his side for fifty yards together.

This remarkable horse first appeared on the turf at the age of five, in 1769. In the first heat he set off of his own accord, and easily gained the race, his rider pulling him in vain with all his force for the last mile. O'Kelly, observing this and being aware of his horse's powers, offered in the second heat to "place the horses," and he took heavy bets that he did so. When called upon to declare he said: "Eclipse first, the rest no place." He gained his wagers. Eclipse was first, and all the others were distanced,

or, in the language of the turf, had no place. From this time Eclipse was continually on the turf, and gained every race. No horse daring to contend with him he closed his career of seventeen months by walking over the Newmarket Course for the King's Plate, in October, 1770. During this brief period it is said that he gained £25,000 for his owner. He was then employed with prodigious profit as a stallion. He got 334 winners at our numerous race courses, who are computed to have gained about £160,000 to their owners, besides cups and plates. He died in 1789 at the age of twenty-five.

Another horse of foreign lineage, scarcely inferior to the Darley Arabian in the fame and value of his descendants, and by many supposed to have exercised a yet more important influence on the horses of the turf, is the Godolphin Barb, who lived a short time later than the Darley Arabian, having been born about the year 1724. This splendid horse was long regarded as an Arabian, although his characters approached to those of the Barb. He was found dragging a water cart in France, and was probably one of those neglected presents of horses, frequent at that time, from the Barbary powers to the French court. He was brought to England and finally presented to Lord Godolphin, in whose stud he remained a considerable time before his value was suspected, and then only it was discovered in consequence of the excellence of one of his sons, Laih, out of Roxana, who proved to be the fleetest horse, Childers excepted, that had till then appeared on the English turf. His grandson, Matchem, was in a peculiar degree noted for the excellence of his stock. This latter horse is supposed to have yielded his owner, Mr. Fenwick, upwards of £17,000 as a stallion alone. He died in 1781, having had 354 sons and daughters, all winners at our numerous race-courses, and computed to have gained to their owners £151,097.

It is the general opinion of the best-informed English turfmen, that the Oriental stallions which contributed most largely to the formation of the English thoroughbred were Place's White Turk, the Byerly Turk, Lister's, or the Straddling Turk, the Darley Arabian, Curwen's Barb, Lord Carlisle's Turk, the Godolphin Arabian (a Barb), the Leeds Arabian, Honeywood's White Arabian, Combe's Grey Ara-

bian, Bell's Grey Arabian, D'Arcy's Turk, Selaby Turk, the Ancaster Turk, Compton's Barb, the Toulouse Barb, Stanyan's Arabian, Lowther Barb, Taffolet Barb, Hutton's Grey Barb, Honeywood's Arab, Sedley Barb, and Wellesley's Arabian. Of those above mentioned, Lister's Turk got Brisk and Snake; Darley Arabian got Flying Childers; Carlisle's Turk got the Bald Galloway, and Godolphin Arabian got Blank, Regulus and Cade. The "Royal Mares" were imported Barbs.

Of these Oriental sires it is generally admitted that the Godolphin Arabian—imported one hundred and sixty-two years ago—is the last that has proven of any benefit to the English stock; and while this blending of the blood of the Orient with the old races of England furnished the foundation, there can not be the slightest doubt that the care and skill of English breeders in selecting and coupling with the stoutest, best and fleetest for successive generations has been a more potent agent in the formation of the breed, as it now exists, than the Arabian and Barb blood, to which tradition has ascribed its superiority. Many importations of the choicest blood of the Orient have been made both to this country and England within the last half century, and yet scarcely a name among them can be found in the pedigree of a horse that has distinguished himself upon the turf. The Arabian horses possess undoubted beauty of form and grace of motion, but they are notoriously inferior in point of size to the average thoroughbred, being rarely over 14 hands high; and their produce from the best of mares have been failures both in the stud and on the race course. In every instance in which the speed and stoutness of our thoroughbreds have been tested side by side with the Arabian they have proven superior to their eastern competitors. Hence, recent crosses of Oriental blood, while they do not

warrant exclusion from the stud book, are not looked upon with favor by the best breeders of England or America. The thoroughbred of today is greatly superior to his Oriental ancestor in size, speed, endurance, and every other useful quality, excepting, possibly, that of docility. So thoroughly have our people been imbued with the idea that Arabia was the fountain-head from which all modern equine excellence has been drawn that to venture an opinion to the contrary has been equivalent, in the mind of the average horse essayist, to writing one's self down as an ignoramus upon equine history. And yet it is doubtful if ever a race of horses has been more thoroughly overrated.

The greater portion of Arabia is, in point of fact, illy adapted to the rearing of horses, and prior to the days of Mahomet horses were scarcely recognized as a part of the possessions of the Arab, their riches consisting chiefly in camels, oxen, sheep and goats. But Mahomet was an enthusiastic lover of the horse, and while he succeeded in engrafting upon so large a proportion of the inhabitants of the eastern world his own peculiar religious tenets he also imbued his followers with a great degree of his enthusiastic admiration for the horse. Indeed, kindness to and love for this noble animal was made a part of the religious duty of all true Mussulmans, and from the days of Mahomet down to the present time the Arabian has held his stud, and especially his mares, in a sort of superstitious reverence. Mahomet selected for himself a magnificent stud, and his followers to this day seek to trace the genealogy of their choicest horses to the mares that were his favorites. But their pedigrees, divested of all the high-sounding flourishes with which they are accompanied, mean but little and are altogether unreliable.

The following is a copy of one of these documents, which

accompanied Hamdan, a grey stallion imported by A. Keene Richards, in 1856, as we find it recorded in Bruce's American Stud Book:

RAMADAN 21, 1272.

This is to certify that, at the date of this document, Messrs. Keene and Troye bought from Sheik Hammed-Es-Sohiman, the son of Shalan, the grey horse, even the horse of Hammed, the son of Sohiman, who is the son of Shalan, even the sheik of the Arabs of Anayza. The said horse is Koheylan, the son of the old Koheylan father, and of an old Koheylan mother. We declare this by fortune, to which God and Mahomed, the apostle of God, are witnesses. There is no better horse, being from the side of both father and mother a blood horse. He is a Koheylan, the son of a Koheylan, and his mother is a Koheylan purer than milk. He was born and brought up in the land of Nesjd.

This is the genealogy of the said horse. God is omnipotent.

The sale was made at the land of Sophira.

[SEAL.] HAMMED-ES-SOHIMAN, *the son of Shalan.*

Witnesses:

The writer of this document, who stands in need of God.

ARD-ALLAH, *the son of Nowphal, the lecturer.*

MAHAMMAD, *the son of Mashial.*

AKHBIEF, *the son of Mashaul.*

ISH-SHE-RA-TAH, *agent of Fysal-Ish-Shalaa.*

As before remarked, Arabia was one of the latest of the Oriental countries to engage in rearing horses; and there can be no question but that the enthusiasm of the followers of the Prophet had as much to do in creating the great reputation that the Arabian horses soon thereafter attained, and which they hold to this day, as the quality of the animals themselves.

The thoroughbred having been for so many generations bred with especial reference to his capacity as a *race*-horse, it is not surprising that he should have acquired peculiarities of form and temper that render him undesirable for the more sober and steady uses of every-day life. He has been

bred to *run*, and the form best adapted to speed, and the mental qualities that most certainly insure the pluck, and energy, and determination so essential to success in a hard-fought race, have been the qualities aimed at by breeders and the standard by which selections have been made. Such a course of breeding has made the thoroughbred, as a racer, rather too lithe and light in form, and too nervous and excitable in temper for ordinary business uses; but in speed, endurance and resolution they surpass all other breeds, and there is scarcely a race of horses in existence but may be improved by a cross with them. This fact is almost universally recognized, and nearly all countries upon the civilized globe have for many years regarded the English thoroughbred, or "blood horse," as the basis of all substantial improvement.

Our American horses are largely permeated with the blood of the English thoroughbred. Many of the best stallions and mares of England have been imported to this country, and their influence is seen on every hand. It enters largely into the ground-work of all our trotting strains, and it is doubtful if a single great road horse or trotter has been produced in this country that did not possess a large share of this royal blood as a foundation upon which the trotting superstructure has been built.

There exists great ignorance, even among many who pass for intelligent, well-informed horsemen, as to what constitutes a thoroughbred horse. Nearly every agricultural society in the land has a class in its premium list for thoroughbred horses; and yet many of the managers of these societies have a very indefinite idea as to what is requisite to render a horse eligible in this class. Questions of this nature are referred to me almost every year for a decision as to eligibility; and many of these are of such a

nature that a very slight knowledge of the subject ought to enable the officers of these societies to decide for themselves. On this account I beg pardon of the well-informed reader while I briefly recapitulate.

In the first place, it should be understood that we derive the term, as well as the breed of horses to which it applies, from our British cousins across the water, as has been fully set forth in the preceding pages; and that the word, when applied to horses, is used to designate one particular breed, and that is the running horse. All our American thoroughbreds are, therefore, imported from England, or are descendants of animals so imported. A recent cross with an imported Arab or Barb, while it does not vitiate the blood nor render an animal ineligible as a thoroughbred, is not usually regarded as desirable, from the fact that the course of selection which has been practiced by the breeders of thoroughbred horses in England and America, for the last hundred years, has given us a race that is generally considered to be far superior to the Oriental horse of today in speed, size and stoutness. The compiler of the stud book for thoroughbred horses in this country has relaxed the English rule somewhat, and admits to registry animals that show an unmixed descent for five generations of pure blood; and while, under this rule, many animals may be admitted that are not, in the strict sense of the word, thoroughbreds, yet if for five generations nothing but thoroughbred sires are to be found in the pedigree, the quantity of alien blood remaining must necessarily be infinitesimally small; and by usage, the animal so bred is, in this country, ranked as a thoroughbred. The American Stud Book for thoroughbred horses, four volumes of which have been issued, is edited and published by Col. S. D. Bruce, of the *Turf, Field and Farm*, New York.

If our agricultural societies would bear in mind that *none* of our American trotters, no matter how long the pedigree, and none of our imported or native draft horses, are eligible to compete for premiums offered for thoroughbreds they would spare themselves much trouble. No pedigree that has Rysdyk's Hambletonian, Abdallah, Morgan, Bellfounder, Hiatoga, Mambrino Chief, Royal George, Patchen or any other of our prominent trotting sires in it can belong to a thoroughbred. It may appear strange to some that it is necessary to make this statement; yet I have seen premiums awarded in the thoroughbred class to trotting stallions at both State and county fairs; and I have known some cases where imported draft horses have been entered in this class, and were supposed to be eligible.

TROTTERS AND ROADSTERS.

We have as yet no distinctive breed of driving horses or roadsters. The horses used for light driving, fast trotting, etc., are largely a conglomeration of all breeds and types. Some approximate the French Canadian pony in form and action, while others possess most of the characteristics of the thoroughbred; but so popular have trotting races become in this country, and so universal is the fancy for fast driving horses, that at almost all our horse shows and fairs the roadster class will be found more largely represented than any other, and usually more largely than all others combined. Indeed, the roadster is more distinctly an American feature than any other in our equine product; and we are fast approaching the time when the American trotting horse will be classed as a distinct breed. It is the creation of an American fancy—the result of a fashion that has demanded the fastest and stoutest trotting horses in the world for driving on the road; and to this end we have

selected and bred until our horses surpass all others in this particular. Among these horses we have several recognized families of especial prominence, all more or less related, but each possessing features that are to some extent peculiarly its own, but none of them entitled to be separately classed as a breed.

Of these we may mention the *Hambletonians*, descended on the paternal side from imported Messenger (a thoroughbred) through his son Mambrino (also a thoroughbred), and Mambrino's son Abdallah, out of a mare of unknown blood, who in turn got Rysdyk's Hambletonian, out of a mare by Bellfounder (an imported Norfolk trotter), and her dam probably having two direct crosses to imported Messenger. Through Rysdyk's Hambletonian, on the paternal side, we have the Volunteers, the Edward Everetts, the Alexander's Abdallahs, the Almonts, the Messenger Durocs, the Sentinels, the Happy Mediums, the George Wilkeses, the Dictators, and all the various so-called Hambletonians of the present day. This celebrated horse was bred in Orange Co., N. Y., foaled in 1849, and was kept in that county until his death, which occurred March 26, 1876.

Then we have the *Mambrinos*, that take their name from Mambrino Chief, who was got by Mambrino Paymaster, a son of the Mambrino above referred to as the grandsire of Rysdyk's Hambletonian. The dam of Mambrino Chief, like the dam of Abdallah, was a mare of unknown blood. He was bred in Orange Co., N. Y., foaled in 1844, and when ten years old was taken to Kentucky, where he died in 1861. Upon the highly-bred and thoroughbred mares of that region he was very successful as a sire of fast trotters, and the mares got by him have been especially noted as producers of great trotters when coupled with other trotting strains.

The *Clays* constitute another trotting family of note. The original Henry Clay was a famous trotting stallion, foaled 1837, got by Andrew Jackson (also a famous trotter), who was a grandson of Bashaw (an imported Barb), and related to imported Messenger through the second dam of his sire, who was by that horse. The dam of Henry Clay was a great trotting mare, whose blood is unknown. From this horse we have the various families of Clays of the present day, and also the Patchens—the trotting stallion Geo. M. Patchen, the greatest trotting stallion of his day, and the original of the name, being a grandson of the original Henry Clay.

The *Morgans* are perhaps our oldest trotting family; and if they have not produced our very fastest trotters, their produce undoubtedly deserve to take the very highest rank as good-tempered, hardy and pleasant roadsters. They are descended, in the paternal line, from a horse called Justin Morgan, who was bred in Vermont, foaled 1793, and died 1821. His blood has never been positively known, although it is pretty well established that the thoroughbred predominated. From him we have the Morrills, the Fearnaughts, the Ethan Allens, the Black Hawks (not including the descendants of Long Island Black Hawk, who was by Andrew Jackson, grandson of Bashaw, above alluded to, and had none of the Morgan blood in his veins), the Daniel Lamberts, the Knoxes and the Golddusts. The popularity of this family at one time was unbounded; and no blood, excepting that of the thoroughbred, has been so generally disseminated and so highly esteemed throughout the United States. At present it is not so highly prized by those who place speed above all other qualities; but go where you will among livery-stable keepers or horse-railroad managers and ask them what type of horse they have found most profit-

able to use and wear out on the road, and they will almost invariably answer, "The old-fashioned Morgan."

The *Bashaws*, another popular family of trotters, are very closely related to the Clays and Patchens, having a common ancestry in Young Bashaw, who was the sire of the Andrew Jackson above referred to. Young Bashaw was by the imported Bashaw, his dam was by a thoroughbred sire, and his grandam was by imported Messenger. The most celebrated of the Bashaw family proper come through Long Island Black Hawk, who was by Andrew Jackson, out of a mare by Mambrino, son of Messenger. Through him we have Green's Bashaw (so well known in the west), the Mohawks, and many others of note.

The *Pilots:* The blood of the old black pacer Pilot, who was of French Canadian ancestry, has mingled kindly with our best trotting strains, and many of our very best and fastest trotters trace to him, mainly through his son Pilot Jr. (a horse bred by the late R. A. Alexander, of Kentucky), out of a mare that was nearly thoroughbred. Old Copper-bottom, also a Canadian pacer; Hiatoga, a horse bred in Virginia; Columbus, and Royal George, both from Canada, have all been very popular sires, and no compendium of the origin of the American trotting horse would be complete without reference to them.

In no department of stock-breeding is the influence of heredity and of patient selection with a view to the transmission and improvement of a desired quality more apparent than in the breeding of the trotting horse. Fifty years ago the American trotting horse, *as a breed*, was unthought of; and one that could trot a mile in less than three minutes was a wonderful animal! But the ability to trot fast was a desirable quality, and breeders sought to perpetuate it. Animals that excelled the average of the

species as trotters were selected to breed from, with a view to perpetuating and intensifying this quality; but as its possession was at that time an accident—a spontaneous variation—it was found that but few of the immediate descendants of the animals first chosen with a view to breeding fast trotters could trot faster than their remote ancestors. But when such of them as did show improvement in this direction were again selected for breeding purposes and coupled together it was found that, while there were still many failures, the proportion of the descendants that showed improvement in the trotting gait beyond the average of their ancestors was materially increased. And so by selecting from generation to generation from such families as have shown a tendency to improvement in this quality we have made considerable progress toward founding a breed of trotting horses.

So generally is the attention of the breeders of trotting horses directed to the "bright, particular stars" in the trotting firmament each year that we lose sight of the immense numbers of horses that trot in 2:30 to 2:50—a gait that twenty-five, and even fifteen years ago, was fast enough to entitle a horse to rank as a creditable performer on the turf; and in our admiration for these great performers we have failed to note the extent to which the *average* speed of the so-called trotting families has been improved. What horseman who has reached the age of fifty years can not remember how very rare three-minute trotters were when he was a boy! And yet what a large proportion of our Hambletonians, Clays, Bashaws and Mambrinos now trot faster than three minutes!

The progress made by American trotters during the past fifteen years, as demonstrated by the average speed of the animals which compete at our prominent trotting

meetings, is something very often overlooked by those who do not give the subject particular attention. Year by year there have been vast accessions to the list of horses with records of 2:30 or better, and of course the influence of this constant influx of fresh speed can not but be made manifest upon the turf. Taking the records of the oldest prominent trotting track—that at Buffalo, N. Y.—as a guide, we find the average time of all the heats trotted there during the summer meetings, from 1866 to 1884, inclusive, to have been as follows:

Year.	*Average time.*
1866	2:38½
1867	2:34½
1868	2:31¾
1869	2:29¼
1870	2:28¾
1871	2:25¾
1872	2:26
1873	2:26½
1874	2:24½
1875	2:25½
1876	2:23
1877	2:24¼
1878	2:21½
1879	2:23¼
1880	2:20
1881	2:20¾
1882	2:21¾
1883	2:21¾
1884	2:21¼

These figures speak volumes. From 2:38½ in 1866 to 2:20 in 1880 and 2:20¾ the following year is a tremendous stride, and it will be seen that the reduction has been a steady as well as a notable one. Of course, it is not every season that such flyers as Maud S. and St. Julien appear at the same meeting, as was the case at Buffalo in 1880, while the following year half a dozen of our best trotters were out at once, which accounts for the exceptionally low average for these two years; but, taking the average of the Buffalo track for the first five years of its existence, we find it to be 2:32½, while for the five years from 1880 to 1884, inclusive, it is reduced to 2:21¼!

While much of this increase in the average speed of our trotting horses should, in justice, be attributed to improvement in our vehicles and tracks, and to increased skill in the trainer, yet it is undeniable that by far the greater por-

tion of it has resulted from increased capacity in our horses, bred for two, three or four generations especially with reference to this quality. It is also worthy of especial remark that over ninety per cent of all the horses with records of 2:25 or better, whose breeding can be traced even as far as the sire, are more or less closely related to one or more of our recognized trotting families.

Hence, while chance trotters may occasionally be produced, as of yore, through spontaneous variations, our breeders and trainers have found that by confining themselves to the descendants of three or four well-known families the probabilities of producing fast trotters are infinitely greater than by going outside; for within these families the trotting gait has been cultivated by selection and use until heredity has begun to lend its powerful aid in transmitting what was originally a spontaneous or accidental superiority; and the breeder who introduces a single cross in which the trotting gait has not become an inherent quality only adds to the probabilities of failure and postpones the day when we shall be able to breed fast trotters with certainty. We have still much to do before we can claim to have established a breed of trotting horses, and the more closely we confine ourselves to judicious selections from the families that *trot* and *produce* trotters the more rapid will be our progress in the formation of a breed in which superiority in the trotting gait shall be an inherent and transmissible quality.

It may *possibly* become necessary to resort to crosses outside of these trotting families for improvement in some other quality; but there is no out-cross that we can possibly make without danger to the transmission and improvement of the trotting gait. Even those of our trotters that belong to none of the recognized trotting families are al-

most invariably the result of selection with a view to this faculty. In almost every case of "breeding unknown" we have found that the dam was "a fast trotter." In short, the more thoroughly we investigate the course of breeding that has produced our trotting horses the more completely does it confirm the theory of breeding from animals that possess the quality we wish to perpetuate.

Those who tell us that we must infuse more of the blood of the thoroughbred into our trotting strains, because that blood is the foundation of all modern excellence in the horse, find their counterpart in those gentlemen of the old school—old fogies I had almost said—who used to be continually arguing for more of the blood of the Orient in the thoroughbred. The argument in each case is identical. The blood of the Arab and of the Barb was the foundation for the more modern thoroughbred. The Oriental horse represented the very highest type of speed and endurance; and from this source the thoroughbred derived all its original excellence. To keep up these good qualities, and to improve the English race horse, these good old gentlemen argued that we must constantly draw from the fountain-head—the source of all improvement. But, by and by, the time came when all horsemen were compelled to admit that a further infusion of this material—which constituted a most excellent foundation—was no longer needed, because the thoroughbred horse of the British Isles had become immensely superior to his Oriental ancestor. English breeding, training and selecting has done the work, and the man who now introduces a cross of the Arab or Barb in his thoroughbred stud is very justly considered blind to his own interest.

And so with breeding trotters. Granted that the endurance, and vim, and energy that makes the great trotter

come from the thoroughbred; and granted, even, that the *form* for speed at the trotting gait comes from the same source; we have selected, and trained, and bred with an especial view to adaptation to this especial purpose, until we have a fixed characteristic—an inheritance of speed at the trotting gait, and an inheritance of mental quality, adapting the horse to this especial use, in which the modern American trotter is as much superior to the average thoroughbred as is the best race horse that ever struck hoof upon the Epsom Downs to the average Arab of today.

Manifestly, the principal valuable qualities that our trotters have derived from the thoroughbred are courage and endurance. No one will claim that, as a breed, the thoroughbreds are fast trotters; and more, no one will claim that a single thoroughbred has ever excelled at that gait, judged by our standard of speed. The trotter is an American product—a creature the result of our own selection, breeding and training. What, then, can we gain by a stronger infusion of the blood of the thoroughbred? Certainly not more speed at the trotting gait, because it is not there, and can not come from that source! We *may*, and doubtless can, in some cases, get more courage and greater powers of endurance from this quarter, but beyond these two qualities I can not conceive of a single point in which the American trotter can be improved by a fresh infusion of racing blood. It is against reason, and against the experience of breeders the world over; and the man who rings the changes on "high breeding," and the "form for speed," and the "disposition to go fast," and the "foundation of all equine excellence," as arguments in favor of breeding from thoroughbreds to produce trotters, voluntarily shuts his eyes to the experience of the world in stock-breeding. The intelligent gentleman who breeds horses for the running turf selects his breeding-

stock from the choicest running strains—the families that can show upon their escutcheon the longest roll of mighty performers—and by pursuing this course he steadily improves his stock; and so the intelligent breeder of trotting horses will select from families in which speed at the trotting gait has become an inherent and transmissible quality.

I can see no reason why this great principle, which forms the correct basis of all good stock-breeding, should not apply to the breeding of trotting horses as well as to setter dogs. The get of a bulldog out of a setter bitch would probably possess more *courage* than a purely-bred setter, and a puppy so bred might *possibly* act well in the field; but no man accustomed to the business would back a litter so bred, in a field trial, against a litter of pure setters! And so, if it is a trotting horse we are after, it has always been my advice that the breeder should get as deeply into the trotting lines of blood as possible. The exceptional cases quoted by the advocates of the thoroughbred prove nothing. We can not go very far as yet into any of our trotting strains of blood without running into a thoroughbred cross, or else running into obscurity. I should certainly very greatly prefer that my trotting brood mare or stallion, after showing a few crosses of Hambletonian, Pilot, Mambrino Chief, and Clay blood, should trace to a thoroughbred ancestry than to the dunghill, because in the former case we know that we are anchored upon a solid foundation of courage and endurance. But we have our trotting structure already reared to handsome proportions upon this foundation; why then should we overturn what has already been done and commence again to build on the same rock? To do so is, in my opinion, a step in the wrong direction.

This position is so self-evident—so perfectly in accord with the known laws of heredity—that I am surprised that

it should be questioned by any man of ordinary intelligence. That mares with one or two trotting crosses on a thoroughbred pedigree are preferable, even for breeding trotters, to mongrels of no individual merit and no pedigree, no one in his sober senses will deny; and that mares by Hambletonian, or Geo. Wilkes, or Mambrino Patchen, or Pilot Jr., or Mambrino Chief, or any other noted trotting sire, out of thoroughbred dams, should themselves produce great trotters when coupled with a well-bred trotting sire, as in the case of the dam of Maud S., is no surprise, and no argument whatever against my position, but confirms it. That the *next* remove from the blood of the race horse, if the remove be with choice trotting blood, will produce a still greater proportion of fast trotters, is what I assert. We want good, tried and approved trotting blood upon this foundation; and the more of this material we can put there, and the further we are pushed away from that foundation *by such material*, the better for certainty in producing fast and reliable trotting horses.

ORLOFF TROTTERS.

Although the Orloff trotters of Russia have been but sparingly introduced into this country, yet they are so frequently referred to in discussions upon horse-breeding, and especially in those pertaining to the breeding of trotting horses, that a history of the breed and a comparison of their merits with our own trotters can not fail to be interesting. The breed takes its name from Count Alexis Orloff Tschismensky, an enthusiastic horseman of Russia, who, in 1775, imported from Arabia a grey stallion named Smetanxa, said to have been of unusual size and strength. A Danish mare was bred to this imported Arabian stallion, and the produce was a horse known as Polkan 1st. From a union of this

half-blood with a Dutch mare sprang a stallion known as Bars 1st, who is generally regarded as the progenitor of the Orloff race of trotters. The fame of this quarter-blood, Bars 1st, was chiefly perpetuated through his sons Lubeznay 1st, Lebed 1st and Dobroy 1st.

It is worthy of especial note that we have an almost exact parallel of the course of breeding which laid the foundation for the Orloff trotting horse in the case of the imported Barb, Grand Bashaw, a grey stallion, imported to the United States from Tripoli by Mr. Joseph C. Morgan. This horse got Young Bashaw (also grey), out of Pearl by First Consul, and he in turn got Andrew Jackson, out of a mare of unknown blood. It will be observed that the Russian trotter Bars 1st and Andrew Jackson were each three removes from their Oriental ancestry, and that in this third remove the trotting excellence first began to manifest itself. Bars 1st laid the foundation for the Orloff trotting horse, and was himself a distinguished trotter; Andrew Jackson was the most noted trotting stallion of his day, and from him are descended the Bashaw, Patchen and Clay trotters of the present time. We have no positive knowledge as to the breeding of the Danish mare, the dam of Polkan 1st, or of the Dutch mare that produced Bars 1st, while Pearl, the dam of Young Bashaw, was a well-bred mare, she being by a thoroughbred sire, out of Fancy by imported Messenger. As to the blood of the dam of Andrew Jackson we are left to conjecture. The similarity of the foundation of these two races of trotting horses is therefore quite apparent.

Count Orloff and his successor, V. T. Shiskin, devoted themselves assiduously to the improvement of these horses, selecting their stallions exclusively from the foundation above alluded to, but resorting frequently to English and Dutch mares of known excellence; so that the Orloff trot-

ter, like the American, is of a mixed origin, and neither the Arab, the Barb nor the English thoroughbred can claim exclusive paternity in either case. Selection and crossing, with a view to adaptation for a specific use, has accomplished the work of creating in both countries a race of trotting horses. Count Orloff was an intelligent enthusiast in the business—as all successful breeders have been—and he persistently refused to part with any of his entire horses, preferring that he alone should dictate the choice of sires to be used to perpetuate and improve the race. After his death the stud was scattered; a considerable portion of it passed into the possession of the crown, but several private studs were founded, and a stud book was instituted to aid in the work of keeping the race free from further admixture, although with the Russians, as with us, the question is not very well settled as to what constitutes the best trotting pedigree, and purity of blood is a rather vague and indefinite term when applied to the Orloff as well as to the American trotter. The Count had been an enthusiastic patron of the race course as a means of developing and testing the powers of his horses, and since his time the government has given its powerful aid to promote the same object, not only by establishing breeding studs, but by furnishing more than one-half of the prize money that is contested for at these trotting races, which have been held regularly in that country for the last sixty years. Russian trials of speed are regulated by law, and the driver or owner who violates any of the rules which have been laid down to secure fair contests is liable to take an unceremonious trip to Siberia at government expense—a punishment that, as might be supposed, is much more effectual in suppressing fraud than is that of an edict of expulsion issued by our National Trotting Association.

I had the pleasure, a few years ago, of meeting Mons. Jules Goujon, who has long been a resident of Moscow, and who is intimately connected with the turf sports of that country. From him I learned many interesting particulars concerning the Orloff horse and the methods of breeding, training and driving in that country. He states that

The entries for the races are according to age qualifications, except that for horses past six years old—they are free for all. The heats are never less than three versts, and the deciding heat is at the same distance. In races of four and one-half versts the deciding heat is at three versts. Races of six and twelve versts are decided in one heat. The first prize is not given to the horse that comes in first in the race, but in the deciding heat. The number of horses entered in each race is unlimited, but they are started three at a time, and the two horses out of the entire number of starters that trot the distance in the least time, according to the watch, take part in the deciding heat. If the horse winning in the first trial comes in second in the second trial then a third heat settles the question of supremacy. Only two moneys are given. There are three tracks, of oval shape, inclosed one within the other, one for each horse. The outer is one and a half versts (one mile) long; the two others are shorter, one by twelve sagenes (eighty-four feet) and the other by twenty-three sagenes (161 feet). The first horse is started on the exterior track, in front of the stand, and the two others, in order to equalize the distance, are started in the rear, on their respective tracks, which are selected by lot.

The horses come up at a jog, each one to his place. A judge is placed beside each horse whose duty it is, by waving a bit of cloth, to notify the starter, who is in the stand, that the horse under his charge has arrived at his position. The horses are started from the stand by the stroke of a bell, which sets in motion at the same time the hands of a great dial which mark minutes and seconds. At the instant the first horse passes the winning score the judge strikes a blow which stops the first hand of the dial, and in the same way for the second horse. This automatic system gives the time of the race, by means of the clock, without error, and enables the judge, who is placed at the distance post to decide which of the horses are distanced, to

better know the precise instant when the race is finished. A distance in Russia is thirty sagenes (210 feet) for a race of three versts, and seventy-five sagenes (525 feet) for a race at a greater distance. Only three false starts are allowed; after that number the judges can fine the driver of the horse that is responsible for the false starts, or can refuse to allow him to go the course. In case a driver does not try to win with a horse the judges may fine him, and on a repetition of the offense he is liable to visit Siberia for a couple of years—a punishment which I imagine, from what I hear, would be salutary for some of your American drivers.

A horse is allowed to make but three breaks during a heat of three versts, and the same number in the deciding heat. If he makes more he is out of the race, and so is he if he makes more than thirteen jumps in one gallop. Each horse in the race has a judge especially assigned to watch his movements, whose decision as to whether the horse makes more than three breaks or more than the permitted number of jumps in one break is without appeal; he has only to touch a button of an electric machine designating the offending horse, and a groom on horseback in front of the stand at once rushes off to notify his driver to quit the track.

For all the prizes given by the societies anyone can trot, as he pleases, to a droschka (the national Russian vehicle, four-wheeled, and very clumsy and heavy as compared with the sulky) or to a sulky with two wheels and four reins. The weight of the vehicle and of the sulky is equally *ad libitum* for all the prizes given by the societies. The government, for prizes which it gives, specifies for itself the kind of vehicle, its weight, the weight of the driver, and the distance to be trotted.

There are two seasons for racing. The summer races occur in May and June, and are trotted twice a week, on Sunday and Wednesday. They are started at 6 o'clock in the evening, the days being so long in Russia that it is light until 11 o'clock at night, and thus the heat of the day is avoided, which is an advantage for both the horses and the spectators.

In winter the races are always trotted on Sundays, and on the ice. But two horses are started at a time, and on the opposite sides of the same course, which is but one verst in length.

The droschka of which Mons. Goujon speaks, although a rather clumsy-looking vehicle to American eyes, is really

a very light and easy-running road wagon, weighing only about seventy pounds. The verst is 3,500 feet in length, being a fraction less than two-thirds of a mile.

I have before me, as I write, a statement of the best time made at all distances, in Russia, each year, from 1861 to 1876, inclusive, from which it would appear that no improvement was made in the speed or endurance of the Orloff trotter during the last five years embraced in this period. The fastest time ever made for one verst was 1:40, by Poitieshnoy, in 1869, which rate of speed, if kept up for one mile, would be a very little below 2:31. This rate of speed has never been reached by any other Russian horse—the nearest approach to it being 1:42⅓. The same horse has the best record at three versts, being 5:00, equal to two miles in 5:01¾. This appears to have been an exceptional case, however, as the next best performances are three versts in 5:06 once, and 5:07 twice. The best time for four and a half versts is 7:52, equal to 7:54¾ for three miles. For seven and a half versts the best time is 13:49, equal to 13:56¾ for five miles. For thirty versts the best time is 1:08:30, equal to twenty miles in 1:08:53½, which is by over 3:00 minutes the best performance by a Russian horse at that distance. Comparing these records with those of our American trotters we find the following:

Best Russian time.		*Best American time.*	*Difference.*
One mile	2:31	One mile	2:09¼—21¾s.
Two miles	*5:01¾	Two miles	4:46 —15¾s.
Three miles	7:52½	Three miles	7:21¼—31¼s.
Five miles	13:56¾	Five miles	13:00 —56¾s.
Twenty miles	1:08:53½	Twenty miles	58:25 —10m. 28½s.

From the foregoing, the superiority of American trotters, at all distances, is very clearly shown; as I do not share in the often-expressed opinion that our system of

* Exceptional time; 5:07¾ being the best with this single exception.

training, our tracks and our vehicles are materially better than the Russian. More than 2,000 American trotters have beaten the best one-mile time made in Russia; and although two-mile races are not common in this country, the exceptionally fast time of 5:01¾ for that distance made by Poitieshnoy has been beaten by nearly all of our great trotters; and I have no doubt but that we have fifty trotters in training today that are capable of beating that time by several seconds. No Orloff trotter has ever succeeded in trotting twenty miles within an hour by nearly nine minutes, while *five* American horses have accomplished that feat. Another point of contrast, in which the American trotter shows at a great advantage over his Russian competitor, appears to be in campaigning qualities. The oldest reported Orloff winner is twelve years. Goldsmith Maid was in her prime at twenty. Pietel, the most noted Orloff campaigner, was a winner for four successive years; the Maid was a winner for thrice that length of time, while most of our great trotters have steadily improved until they were fifteen or sixteen years of age.

It is also worthy of note that while the Russian trotter appears to have attained his maximum of speed several years ago, the improvement on the part of our American horses in this respect, within the past ten years, has been truly wonderful. Certainly the showing for speed and endurance of the Orloff trotter does not compare favorably with the American, although the former undoubtedly possesses both of these qualities to a high degree. It is claimed, however, that in beauty of form the Orloff is greatly the superior of our American production; but here, again, I must be permitted to put in a demurrer; for, if the animals that I have seen may be taken as fair specimens of the breed, the facts are certainly the reverse of this state-

ment. Our breeders will undoubtedly object to the prevailing color of the Orloffs, as upon an analysis of the winners in that country we find that fifty-five per cent are greys, twenty-four per cent blacks, fourteen per cent bays or browns, and six per cent light bays.

CLEVELAND BAYS.

Many years ago, before railways came into general use, there was recognized in England a breed of horses called Cleveland Bays; but with the general application of steam to the uses of locomotion the breed fell into disuse, and all English authors, with whom I am conversant, who have written within the past thirty years upon the horses of Great Britain have treated the breed as extinct. Within the past three years, however, there has been a determined effort upon the part of Yorkshire breeders to gather up whatever may be yet remaining of this once popular blood and to resuscitate the breed. To this end a society was organized about a year ago, and Vol. I of the Cleveland Bay Stud Book has just been issued as a result of this effort. How much of the old blood has been found, and what were the conditions essential to admission in this initial volume, I am not able to state, as I have not yet seen a copy of the work.

Following modern English authors and the English agricultural press, I have repeatedly within the past ten years expressed the opinion that the Cleveland Bays were no longer regarded as a distinct breed in that country, and for expressing such an opinion I have been subjected to much ill-natured criticism. I certainly had no reason to misrepresent the facts, and I only aimed to give accurate, reliable information, to those who asked for it, upon a subject that interested all horse-breeders. Within a year or two

past the English agricultural press have begun to again speak of the Cleveland Bay as a breed, but as late as Nov. 18, 1881, I find the London *Live-Stock Journal*, the only distinctively live-stock serial publication in Great Britain, stating that:

> The Cleveland that some people write about is not a Cleveland; it is only the nearest approach to what the Cleveland was like. If there is such a thing as a pure Cleveland the owner should stick to him; the breed, it is possible, may be resuscitated.

The *Mark Lane Express* of about the same date qualified a reference of the same sort by the remark, "if there be such a breed;" and Mr. Frederick Street, who as late as 1883 wrote "The History of the Shire Horse" in England, speaking of the heavier classes of horses, says: "The only distinct breeds now recognized are the Shire horse or English Cart horse, the Clydesdale and the Suffolk, the Cleveland Bay being well-nigh extinct."

The standard writers upon the horse for many years past, such as Youatt & Burn, Youatt & Spooner, Prof. Low and "Frank Forrester," have all treated of the Cleveland Bay as an extinct breed. "Frank Forrester" (Henry William Herbert), the most recent of these writers, in Vol. II, p. 20, of his great work, speaks as follows of the course of breeding which has rendered the Cleveland Bay extinct:

> The first gradation, when pace became a desideratum with hounds, was the stinting of the best Cleveland Bay mares to good thoroughbred horses, with a view to the progeny turning out hunters, troop-horses, or, in the last resort, stage-coach horses, or, as they were termed, machiners. The most promising of these half-bred colts were kept as stallions; and mares, of the same type with their dams, stinted to them, produced the improved English carriage horse of fifty years ago.
>
> The next step was the putting of the half-bred fillies, by thoroughbreds out of Cleveland Bay mares, a second time to thoroughbred stallions; their progeny to become the hunters, while them-

selves and their brothers were lowered into the carriage horses; and the half-bred stallions, which had been the getters of carriage horses, were degraded into the sires of the new, improved cart horse.

From this, one step more, brings us to the ordinary hunter of the present day of provincial hunting countries, for light weights, and persons not willing, or able, to pay the price of thoroughbreds. These are the produce of the third and fourth crosses of thorough blood on the improved mares, descended in the third or fourth degree from the Cleveland Bay stock, and are in every way superior, able and beautiful animals, possessing speed and endurance sufficient to live with the best hounds in any country, except the very fastest, such as the Melton Mowbray, the Northamptonshire, and, perhaps, the Vale of Belvoir, where the fields are so large, the land all in grass, and the scent so fine that fox-hunting in them is in fact steeple-chasing; so that no fox can live before the hounds on a fine scenting day above half an hour, nor any horse, except a thoroughbred, live even that time *with* the hounds, having fourteen stone or upward on his back.

No sort of breeding in England is so profitable as this. The breeder is comparatively secure against anything like ultimate loss, while he has a fair chance of drawing a capital prize, in the shape of a first-rate hunter or a carriage horse of superior quality; and it is to the breeding of such a class of animals that the attention of the farmers, in horse-breeding counties, is wholly directed at this date.

For this reason one has no more pure Cleveland Bays, the use of the stallion of that breed being entirely discontinued; large, bony, slow thoroughbreds of good form and great power, which have not succeeded on the turf, having been substituted for them, even for the getting of cart and farming-team horses; and the farmers finding it decidedly to their advantage to work large, roomy, bony, half or two-third-bred mares, out of which, when they grow old, or if by chance they meet with an accident, they may raise hunters, coach horses, or, at the worst, chargers or machiners, rather than to plow with garrons and weeds, the stock of which would be valueless and worthless, except for the merest drudgery.

It must be conceded, therefore, that if I was wrong in stating that the Cleveland Bays were no longer recognized

in England as a distinct breed I was at least in good company.

About three years ago I addressed a letter to Mr. Geo. T. Turner, editor of the *Mark Lane Express*, of London, asking for his opinion as to whether the Cleveland Bay still existed as a distinct breed in that country. He replied in substance that of late a demand for the old sort of Cleveland Bays had sprung up, and the breed was in a fair way to be resusciiated. He thought there was material enough left to operate on, and stated, to quote his exact words, that "the Cleveland is undoubtedly the produce of the thoroughbred horse (race horse or hunting stallion) on the North country cart mares; this was the origin of the breed, and it was created for coaching purposes. The coaches, toward the last, required faster horses, and these were superseded by the railway. So the Cleveland fell into disuetude. Now they are wanted again for fast, heavy town work. If a stud book were started we should see that material was in existence." He added that he would agitate the question in England.

A week or two later there appeared in his paper, the *Mark Lane Express*, the following:

In reply to a question from a correspondent in the United States as to the present status of the Cleveland breed of horses in this country, we are of opinion that there is material enough left, especially in Yorkshire, to form the basis of a herd book and a very profitable breeders' industry. The railway locomotive drove the old Cleveland Bay horse off the road, but the more modern type of Cleveland horse, or, at all events Yorkshire-bred horses of the Cleveland stamp, with rather more of the thoroughbred stallion's influence apparent, are precisely the cattle that are to be seen in the use of railway companies for their lighter work, especially the newly-appointed omnibuses which have been started by the railway companies in London, and for which the cheaper French horses hitherto used are neither strong enough nor fast

enough. It is remarkable that the railway companies, which took the old Cleveland horse's occupation away, should be among the first to give it back again in a different form; but it is plain enough to anyone who will give the necessary attention to the subject that the light van work of the new heavy omnibus work of the metroplis is bringing to London a lot of very superior and valuable horses from the northern breeding districts, which to all appearances have the old Cleveland blood for their basis, and which obtain their speed and style from the judicious use of the blood of the thoroughbred stallion.

This seems to leave no room for doubt that the so-called Cleveland Bay of today is being created, as was the breed when it was formerly considered a breed, by a mingling of the blood of the thoroughbred race horse with that of the large bay mares of Yorkshire; hence, while I adhere to the opinion that, properly speaking, the old Cleveland Bay has become extinct, *as a breed*, yet I am free to admit that there is still much stock remaining in that region possessing the old Cleveland Bay characteristics, and perhaps much of the blood that formerly belonged to this breed; and it is evident that the same course of breeding which originally formed the breed might speedily restore it from the material now remaining in that country, as well as in this, viz.: the use of stout, strong and stylish thoroughbred sires upon large, active and stylish bay mares. Whatever of this material there may yet be in existence in Yorkshire and elsewhere in England will no doubt be utilized for this purpose, and to this end the new Cleveland Stud Book will doubtless be of great service.

ENGLISH SHIRE OR CART HORSES.

No point in equine history is better established than is the fact that to the regions bordering on the western coast of Europe, once known as Normandy and Flanders, the

world is indebted for the basis of its various breeds of draft horses. Flanders especially was famed, away back in the middle ages, for its famous breed of black horses; and this race appears to have been the prevailing one throughout the north of ancient Gaul and of Germany, from the mouth of the Rhine, eastward, and Prof. Low thinks, "inhabited in the wild state the vast region of marsh and forest which stretched all through Europe, eastward, to the Euxine sea." It was from this source that the rulers of Great Britain drew in large numbers for the purpose of increasing the size of the horses of the Island. How or when this breed originated is a subject upon which history throws no light; but as early as the eleventh century they were largely imported into England, and royal edicts and regulations were repeatedly issued for the purpose of encouraging the use of the large stallions of this breed. King John imported at one time 100 choice stallions from Flanders, Edward II followed in the same course, and it would seem that in the time of Henry VIII these Flemish horses were inseparably associated in the British mind with the idea of immense size and massive proportions, for we are told that when King Henry first saw the Princess Anna of Cleves, a remarkably large coarsely-formed woman, who was to be his fourth spouse, he expressed his opinion of her by the ejaculation: "Egad, she is built like unto a great Flanders mare!"

It is not my purpose to follow up, step by step, the several importations that were made, from time to time, of these heavy horses from Germany, Holland and Flanders, nor to recount the various stages of development which resulted in the formation of what is now known as the Shire horse or English Cart horse. One of the early Earls of Huntingdon is mentioned by Prof. Low as having been especially active in his efforts to improve the British breeds

of heavy horses; and Robert Bakewell, who first taught the world the great principles of good stock-breeding, brought his great genius and skill to bear upon the same object. He went himself to Holland, where he selected several mares which he brought back with him to England; and by pursuing the same methods of careful selection, mating and feeding by which he had achieved such distinguished success with other kinds of stock, he showed the English people how to form a breed of draft horses which has since become famous the world over. Other breeders followed his example, and as late as the beginning of the present century importations of both stallions and mares from Flanders were by no means uncommon.

At this time the black color was still a characteristic and distinguishing feature of the heavy horses of England, as it was of the parent stock from across the channel. They were of immense size, with great strength, but were heavy, dull and sluggish in temperament, and slow and awkward in motion. Prof. Low, writing of these horses in his "Domesticated Animals of the British Islands," says:

The modern English Black horse retains the general characteristics of the pre-existing race, but greatly modified. His color is usually a sooty black, with frequently a white lozenge-shaped mark on the forehead; and he has very generally one or more of the feet and part of the legs, and not unfrequently the muzzle, white. His body is massive, compact and round; his limbs are stout, his chest is enormously broad, and his neck and back are short. His mane is thick and somewhat frizzled, and his legs below the knee and hock are hairy down to the heels. His whole aspect conveys the idea of great physical power without corresponding action. The main defects of his conformation and temperament are his too great bulk of body and want of action and mettle. For a pull with a heavy weight he is admirable; but he steps out short, and is slow in all his motions.

These powerful horses are in extensive demand, not only in the midland counties, where they are reared, but over all the

south of England, for the labors of the field, and for wagons and heavy carriages of all kinds. They are everywhere to be seen, moving at a slow pace, in the numerous heavy wagons by which merchandise is conveyed inland, and in great numbers in all the larger cities and sea-port towns, where they are used for transport of heavy goods at wharfs, for the carriage of coals, timber, building materials, and for a thousand purposes. In London, where the largest and finest are in demand for the carts of brewers, the wagons of coal merchants, and other uses, the stranger sees with admiration the vast number of enormous carriages in endless motion through the crowded streets, drawn by teams of the largest horses in the world; and, doubtless, there is something noble in the aspect of these huge creatures, yoked in lines, and obedient to the voice amidst all the tumult of a great city; but examination shows that there is an excessive waste of power, both in the unnecessary bulk of the animals and in the manner in which their services are performed. They are usually attached in lines, which causes them to pull by sudden jerks and with unequal force; and, in turning the corners of narrow streets and lanes, it is often seen that the entire weight of the enormous carriage is thrown, for a time, upon the shaft horse. It is contended by many that extreme weight and bulk of body are necessary for these horses to enable them to resist the jolting and sudden obstacles encountered on the rough pavement which they never leave. But, in truth, it is habit and a species of pride which lead the owners of wagons to prefer the largest and most showy horses to those of moderate size and more useful action; for experience can not but show that it is muscular force and not the *vis inertiæ* of great weight of body which best enables a horse to overcome continued obstacles. The mere gratification of taste, however, in the employment of these splendid horses would scarcely require a passing censure were it not that this gratification exercises a really hurtful influence in the breeding districts, causing attention to be directed to size and appearance rather than to useful properties, and tending to perpetuate that unnecessary bulk of body which constitutes so great a defect in the breed. Nor is this influence unimportant in degree; for it is to be observed that the demand for horses of the largest class is not confined to the capital, but extends to all the numerous cities and populous towns where drays and wagons are in use. When animals of the largest

size are in demand, and the highest prices are paid for them, it becomes the interest of breeders to employ large stallions and use every means to favor the development of size in individuals. In the counties of Lincoln and Cambridge, whence the great London drays are chiefly supplied, a breeder measures his success by the stature of the individuals which he is able to rear. At the age of two and one-half years the colts are often seventeen hands high. They are bought at this age by graziers near the capital and used in the light work of the plow until four years old, when they are fit for the services to which they are destined, and disposed of at high prices.

In 1879 a society was organized in England for the purpose of preparing and publishing a stud book of the Shire or Cart horse of England, and in February, 1880, the first volume of the work, which has since grown to five volumes, was issued. In an introduction to this first volume by R. S. Reynolds, M. R. C. V. S., it is stated that:

The draft horse of the present day undoubtedly, and unfortunately, is one of mixed and impure breed; there exist few, if any, whose genealogy on both dam's and sire's side can be traced for even four generations. The assumption of an admixture of extrinsic blood is made more evident by comparison of the conformation and color of the existing race with the Shire horse of seventy years ago. Authorities upon horse-breeding forty or fifty years since were ceaseless in their objections to the slow, ponderous movement of the draft horses of their day, and strongly urged the necessity for crossing them with animals of more slender build, in order to attain increased activity and quicker pace. A large section of the horse-working community is now suffering from a too extended application of this crossing, possibly because breeders did not pursue an intelligent and systematic course in the selection of suitable animals for the attainment of their intended object, leaving too much to fortuitous circumstances, and probably attaching too much importance to activity, which, if attained at the expense of deterioration in strength, becomes a defect for the purposes of town work.

For the business of commercial centers like Liverpool, for instance, where the team work is subordinate to the dock, ware-

house and railway regulations, rapidity of movement is found to be a very secondary desideratum to the possession of individual strength. Under these conditions a team (two) of dray horses must be fully capable of working a net load of five tons, the task of shafting which it is obvious no lightly-built animal can accomplish satisfactorily.

A written description of a high-class Shire stallion of sixty years ago may, for the purpose of comparison, possess considerable interest to breeders of the present time. Such a sketch can, of course, but very imperfectly convey to the reader's mind an idea of the conformation of one of these old sires, but it may possibly afford a framework whereon his imagination can build those features which a literary representation fails to make clear.

With very few exceptions (and those exceptions chestnut), black, dark brown and grey are the only colors met with in the descriptions of draft stallions living in the first quarter of the present century. To account for this limitation two reasons may be advanced: firstly, fashion in color may have been considered a very important element in the selection of a sire; secondly, the light browns, bays, chestnuts and roans of the present day are probably due to extensive infusions of light-horse blood.

Whichever of the two reasons is accepted as the correct one, inquiry among old horsemen leaves no room for doubt that black, brown and grey were by far the most common colors of draft horses. It is further ascertained that black predominated over the two other colors, so much so that the eastern counties horse was known and described as the "Black Lincolnshire horse," also that the highly-esteemed brood mares of Derbyshire were chiefly of that color. The color of the black horse was not remarkable for intensity, but partook more of a very dark slaty hue, some few specimens of which are now occasionally seen in Lincolnshire. In the majority of cases these black horses were marked to a very considerable extent with white upon the legs and face. In Derbyshire the white facial markings often gave rise to the names of horses; for instance, the numerous "Blazes" were undoubtedly so called from the possession of a blaze face; other appellations, as "Ball," "Bald horse," "Balled-faced horse," more rarely met with, possibly implied a greater suffusion with white than the title "Blaze."

In Staffordshire the prevailing color appears to have been

brown; as early as 1806 horses are described as descendants of the "old brown Staffordshire breed." Grey horses appear to have been more common in counties south of Derbyshire and Staffordshire, but it is probable that the coats of many of the so-called black horses had interspersed therein a considerable sprinkling of white hairs, and that they were occasionally described as greys; there is one instance, about forty years ago, of an Oxfordshire horse being sometimes described as a black and at another period a grey.

The head was large in all its dimensions, well placed on the neck by strong, broad and deep attachment; the forehead and face wide, expressive and intelligent; a side-view of the jaws and muzzle represented those parts to be remarkable for depth; the ears were small and carried slightly outwards; the eyes somewhat small, not prominent, but generally mild and moderately intelligent in expression; the nostrils and mouth large, firm and well closed; the neck was long, arched and remarkable for its depth, and for the strength of its insertion *between* the shoulder-blades, not as it is now frequently seen, badly placed, by having the appearance of being fused, as it were, *upon* the front edge of the blade-bones, a conformation affording insufficient room for the collar, and therefore one most defective for the purposes of heavy draft. The shoulders were massive, muscular, upright, low and thick at the withers, thrown well outwards beyond the insertion of the neck by the front ribs being properly arched. The fore arm was long, strong and muscular; the knee broad and flat in all its aspects: the fore and hind canons short and thick, frequently measuring upwards of twelve inches in circumference, covered with coarse skin, and having a "beefy" appearance and touch, more marked in advanced age than in youth. The pastern bones of the fore leg were very short, strong and upright, those of the hind leg being much more obliquely placed. The feet, as a rule, especially the fore ones, were large, flat, weak at the heels, and invested with horn of somewhat soft and spongy texture. Thighs narrow, being insufficiently clothed with muscle on their inner aspects to prevent the appearance of what is vulgarly but characteristically termed "split up." The hocks were of rather defective formation, but showing little predisposition to disease, generally too short, too round, and not sharply defined; for these reasons it may be inferred that the hind action was limited and

comparatively wanting in elasticity. The general contour of the hind legs was considerably bent, the hocks being thrown backward and the feet forward. The breast wide and full of muscle, indicative of great strength rather than quick movement; the back longer, narrower and "dipping" rather too much behind the withers. The heart-ribs were well arched, but not very deep; the hinder ones were also rounded, but short, the last one placed too far forward, giving to the body an appearance of undue length and "lightness." The croup bent at considerable angle, denoting what would now be considered want of quality. The dock strong and thick, with powerful broad attachment to the trunk.

The *tout ensemble* of the stallion exhibited grand development of the fore-hand, which rendered the appearance of the hind parts very mean by comparison—a conformation, however, that a moment's reflection will show to be in perfect accord with natural ordination; from mankind downward, in the scale of mammalian creation, the entire male is deficient in that development of the posterior parts so notable in the perfect female of each species, and for apparent reasons.

The growth of hair upon these old stallions was remarkably luxuriant, that of the mane and tail being abundant, strong in texture, glossy, and very often several feet in length. The canons, fetlocks and coronets, both fore and hind, were garnished with a profusion of coarse long hair, distinctive of the Cart horse breed. The silky growth in corresponding situations of the present day has probably become thus modified from the admixture of extrinsic blood, from local influences, from altered methods in the system of rearing and managing young stock, or from a combination of two or all these causes.

It is perhaps worthy of observation that there were, and still remain, some specimens of three apparently distinct types of draft horses exemplified by differences in the local distribution of long hair:

First. Horses having the upper lip garnished with a long, thick mustache, considered at one time a distinguishing characteristic of the Lincolnshire horse. The color of these appendages is always black, white, or a mixture of the two, and invariably corresponds with the hue of the skin from which they spring.

Second. Horses having the lips, muzzle and eyelids destitute

of hair. The skin in these situations, being either entirely bald or covered with exceedingly fine down, is almost invariably flesh-colored, sometimes marked with small dark spots and blotches. Specimens of this type may possibly have originated the appellations "bald horse" and "balled-faced horse."

Third. Horses having a long tuft of hair growing from the front of each knee, and rarer examples having also a similar growth (quite distinct from the ordinary hair of the back of the canons) from the hind part of the hock, just below its point. Animals of this type are now seldom seen. In my experience they are more frequently met with in Wales than in the English shires, though no reason can be assigned why that is so. It is found that these peculiar hirsute growths invariably accompany a luxuriant development of long hair in its ordinary situations, and generally a more than ordinary strength of bone below the knees and hocks. Sex does not appear to exert any influence in determining the special characteristics of any of the three types, stallions, mares and geldings being equally prone to inherit these peculiarities from progenitors similarly possessed.

These horses have long been extensively bred in Leicestershire, Staffordshire, Derbyshire, Oxfordshire, Lancashire, Yorkshire, Cheshire, Nottingham, Northampton, Lincolnshire and Cambridgeshire; the last two counties named perhaps producing the most thoroughly characteristic and representative animals of the breed.

The importation of this great breed of heavy horses to America has not been pushed with as much energy, nor carried on to anything like so great an extent, as the merits of the breed would have justified. Occasional importations of one or two individual animals have been made from time to time, but it is only within the past five or six years that they have been imported in any considerable numbers. They are growing rapidly in popularity, however, in the great agricultural States of the Mississippi valley, and steps are now being taken to secure the publication of a stud book for the breed in the United States.

CLYDESDALES.

To recount the origin of the Clydesdale breed, now so popular and so extensively diffused throughout the United States, would simply be to recapitulate much of what has been written in the preceding pages concerning the origin of the draft breeds of England, for they have been evolved from the same original stock and by substantially the same course of selection and breeding. We have the same origin for both breeds in the great Black horse breed of Flanders. We hear of their introduction first in Lanarkshire, the original home of the Clydesdale breed, when William, Earl of Douglas (one of the ancestors of the Duke of Hamilton, who in later years became so famous as a breeder of Clydesdales), obtained an especial edict of "safe conduct" from King Edward I to take "ten grooms and ten large horses from certain places in Scotland to certain places in Teviotdale in the King's dominions." This safe conduct was issued July 1, 1352, and is the earliest positive mention we have of great horses in Scotland. The editor of the Clydesdale Stud Book, commenting on this document, says:

Unfortunately it does not say where the horses came from; but as Baliol held the Douglas estates it would appear as though they were to be taken from Lanarkshire into Teviotdale, then in possession of the English. Douglas' quarrel with his kinsman, William of Douglas, the Knight of Liddesdale, whom he slew, taking possession of his estates; his rupture with King Edward of England, and his turning of Baliol out of the ancestral estates of the Douglas family in Liddesdale, Annandale and Clydesdale, leave little room for doubt that, if large horses did not exist in Lanarkshire previous to this date, as the extensive trade done with Flanders by the Scottish merchants lead us to believe they did, some, if not all, of the black stallions found their way to Douglas Castle, in the Upper Ward of Lanarkshire.*

* Clydesdale Stud Book, Vol. II, p. xvi.

Scotch authorities generally concur in naming the Upper Ward of Lanarkshire as the place where the Clydesdale breed was first brought to any considerable degree of perfection, and in the "Retrospective Volume" of the Clydesdale Stud Book we read that:

Some time between 1715 and 1720, John Paterson, of Lochlyoch, on the estate and in the parish of Carmichael, grandson of one John Paterson, who died at Lochlyoch in 1682, went to England and brought from thence a Flemish stallion, which is said to have so greatly improved the breed in the Upper Ward as to have made them noted all over Scotland. The Lochlyoch mares were famous in the Upper Ward during the latter half of the last and the first two decades of the present century; and a Mrs. Paterson, of Lochlyoch, mother of the present tenant of Drumalbin, now ninety-seven years of age, still has recollection of a noted black mare from which many of the best stock in the Upper Ward are descended. The family tradition is strongly supported by the fact that the Patersons were in the habit of noting down important agricultural items from a very early period; and the present representative of the family, Mr. Paterson of Drumalbin, has in his possession a family tree of all the descendants of that John Paterson who died in 1682. In the year 1836, in reference to a day's plowing given to one of the Patersons on leaving Lochlyoch for Drumalbin, the following remarks appeared in an Edinburgh newspaper, from which it will be seen that their claim to being the founders of the breed was then recognized. After descanting on the merits of the family and kindred topics, the writer proceeds: "And it may be here worthy of remark, that it was a brother of Mr. Paterson's grandfather who brought the notable stallion from England to Lanarkshire—the sire of the famous Clydesdale breed of horses of which the county has been so long and justly proud."

What were the distinguishing features of the native breed previous to the introduction of the Flemish horse, about 1715, can not now be definitely determined, but there can be little doubt that they were mostly of English origin, and of a mixed character. The old drove road from Scotland to England crosses the Clyde at Hyndford Bridge, and leads across the hills by Carmichael and Crawfordjohn—the very center of the then horse-

breeding district; and the intercourse which the farmers would thus have with their neighbors from the south, and the amount of traffic done by pack-horses, would doubtless allow of many opportunities for selecting animals calculated to improve the breed.

The Lochlyoch mares were generally browns and blacks, with white faces and a little white on their legs; they had grey hairs in their tails, occasional grey hairs over their bodies, and invariably a white spot on their belly, this latter being recognized as a mark of distinct purity of blood. The mares died out at Lochlyoch about thirty years ago.

The Lochlyoch stock having been long noted in the Upper Ward and largely drawn upon by breeders, there is no doubt that to them, or, more correctly, to the black horse of 1715, the Clydesdale horse owes its present distinctive character.*

There can be no question as to the fact that there has been an almost constant mingling of the blood of the Shire or Cart horse of England with that of the Clydesdale of Scotland, and that at the present day the differences between the two breeds are so very slight that many intelligent breeders of both England and Scotland have urged, and continue to urge, that they should be classed as a single breed, and that but one stud book should be maintained for them. It is a well-known fact that the "English cross" can be clearly traced in the pedigrees of some of the most successful prize-winners and sires of Scotland. In 1877 the Clydesdale Society of Great Britain and Ireland was formed, and the compilation of the Clydesdale Stud Book was at once begun. The work has been vigorously followed up until six volumes have been issued. This fact, taken in connection with the organization of the English Cart-Horse Society and the publication of its stud book, clearly indicates that the lines are to be more closely drawn hereafter, and that henceforth crossing between the heavy horses of

* Clydesdale Stud Book, Vol. I, p. xvii.

England and Scotland will not be regarded with favor. Hence we may expect to see the draft horses of the two countries each gradually assuming a more distinct type within a few generations of equine life.

Further interesting information concerning the early history of Clydesdale breeding in Scotland I quote from the introduction to Vol. II of the Clydesdale Stud Book, as follows:

From the articles in a large and handsome work on our "National Breeds of Animals," published under the auspices of the Highland and Agricultural Society, with beautiful illustrations by Howe, it would appear that the Upper Ward farmers brought several animals from England which bred well. Thus in an account of Meg, which won first prize at the Highland and Agricultural Society's Show at Glasgow in 1828, it was said that she was by a grandson of Young Britain, by James Thompson's (of Broomfield, Glasgow) Britain, a grandson of Blaze, a horse belonging to Mr. Scott, of Brownhill, Carstairs, Lanark, which, as mentioned in the history to the retrospective volume, won the first prize at a show held in the Grassmarket, Edinburgh, in 1785. Blaze, which traveled in the Lothians and Berwickshire, is described as a beautiful jet black, his legs silvery white to the knees and hocks, and a broad white stripe or blaze down the face. In a letter from Mr. French, of Burnhouses, who, at the request of the editor of the volume, waited upon Mr. Scott, then eighty-nine years of age, the sire of Blaze is said to have been an English draft horse. This may possibly have been the case; but from the description given of the heavy, black horses of England of that period it is not likely to have been one of them, but more likely a Cleveland, if not one of the lighter-legged pack horses used in Yorkshire and other parts of England at the commencement of the present century. The dam of Young Briton is also reported to have been a Derbyshire mare. Meg, which is a brown with white markings, the same color as her dam, is a stylish, upstanding, lengthy mare, with an exceedingly neat head and clean legs; in fact, she is what would nowadays almost be described by west-country dealers as "gyp." A portrait is also given in the work of a noted horse, Young Clydes-

dale, a stallion of considerable reputation at the time in the Lothians and Berwick. He is represented in plow harness, with collar and "breeching," a costume now rarely seen on a stallion. Like Meg, he seems to possess a thoroughbred look about the head, in which is set a very full, vigorous eye, has a shoulder well sloped, and an apparently clean fore leg, with a slight fringe. His fault on the portrait, which, it has to be remarked, is drawn from life, is want of muscular development in the hind quarters and thighs. There is a total absence, as in the case of Meg, of superfluous hair, the pastern-joints and foot being clearly defined. In color Young Clydesdale was a jet black, with white markings. He is said to have been descended from Blaze, the colors of the most successful progeny of which seem to have been blacks and greys—colors not now in favor, the latter being, as regards entire colts, very unfashionable. This is, no doubt, owing to the action of the Highland and Agricultural Society in restricting their competition to black-bays and brown-bays, and Mr. Frame's practice of castrating all grey colts.

Probably the directors thought grey an unsuitable color at the time for horses for agricultural purposes. As the ban is now removed in competition, and as grey horses look particularly stylish in street lorries, little objection can be taken to them. Grey horses, it may be remarked, are of a different original stock to either blacks or bays, Campbell Smith, in his work, being of the opinion that they are part of the original grey or white stock of the Euxine, and that they are always of higher stature than the bays, which are from Africa, the Teutonic word *bayard*, from which, in his opinion, the word bay is derived, signifying "a horse." It is worthy of notice that the latter word is never used to denote colors of animals other than horses. The greys are always, too, it will be observed, strong, handsome horses, and in days when the color was more fashionable among breeders were preferred as cavalry chargers, hence those magnificent horses of the Scots Greys which evoked the admiration of Napoleon I at Waterloo. That the breed was distinct in descent, till mixed within the past 150 years or so, may be noted from the fact that you rarely, if ever, get a grey unless the sire or dam is grey, while the fact that you can get a brown from a grey or with a grey stallion shows that the strain has gradually been overpowered by the denser blood of the blacks and browns.

It has been remarked that the Clydesdale has been improved as regards size and strength during the past thirty or forty years, or since the period when Young Clydesdale's type was fashionable. A good deal of this is due to the admixture of blood from the south, which has, however, been done at the risk of losing ancient important characteristics of activity and quality. Those breeders who have worked in this direction have generally, however, kept the Clydesdale type in view, and no doubt many of the animals brought back were crosses from the Scotch horses or mares, which the south-country buyers purchased from time to time at the Scottish fairs, but the pedigrees of which could not unfortunately be traced. The breed, therefore, has not been so much improved as some writers would try to make out, and at Kilburn Show the merest tyro in horses could distinguish in their classes the Clydesdales from the more ponderous but less active draft horses of the English shires.

It is well known that the Clydesdale owes its quality and other good characteristics to the pasture; sluggishness and coarse, greasy legs being the characteristics of animals reared in low-lying lands with moist pastures; while on dry hill or mixed sandy lands, the grass of which contains plenty of lime, active animals, with sound, clean legs and healthy, durable hoofs, are bred and grazed to advantage. * * * Indeed, to the rich sand-mixed lands of Kintyre, the healthy herbage which covers the thin soils of the Galloways, and the nourishing blades of grass which cover the lime-containing hills of Lanarkshire, the Clydesdale of the present day greatly owes his activity and quality, characteristics which have always rendered him superior in the eyes of the foreigner when viewed alongside his more massive market competitor in the south, reared on the "wershy" herbage of the fens.

Modern Clydesdales are of all colors, bays, browns and blacks predominating, although there are some greys and chestnuts, while white markings on face, feet and legs are quite common with all the colors. They have been extensively imported into the United States and Canada, and have exercised a very powerful influence upon the horse stock of our country. No other breed of draft horses, saving the Percherons, has been so extensively introduced, and be-

tween these two breeds the contest for popular favor has been waged upon very nearly equal terms for several years past. The question of color has always been a strong point in favor of the Clydesdales with American breeders as against their French rivals, the latter being usually grey, while with the former dark colors are the prevailing ones.

The Clydesdale Society of America was organized in 1877. The first volume of the American Clydesdale Stud Book was issued in 1882, and Vol. II of the work has just been printed. Col. Chas. F. Mills, of Springfield, Ill., has been secretary of the society from its organization, and has done a valuable service to the Clydesdale interest in America by compiling the records of the early importations and preparing for publication the two volumes of the stud book that have been issued. The rules governing entries in this stud book require that American-bred stallions and mares must trace to recorded sires or dams, or have four or five recorded top crosses respectively, and in case of importation to be recorded in the Clydesdale Stud Book of Great Britain and Ireland.

PERCHERONS.

The Percheron is an ancient French breed, originally famed for its capacity for rapid locomotion with a heavy load, and especially adapted to drawing the heavy diligences or post-coaches used in France before the days of the railway and locomotive. Tradition has long attributed to the Percheron—confessedly among the most active and powerful of the heavy breeds of the European continent—an Oriental origin; but it was not until the researches recently made in the compilation of pedigrees for the first volume of the Percheron Stud Book of France that the extent to which the blood of the Orient had entered into the formation of

the Percheron race was fully realized. What the Darley Arabian was to the English thoroughbred, and the Grey Arabian Smetanxa to the Orloff, the Grey Arabian Gallipoli has been to the Percheron horse of France. Diligent and persistent inquiry in the family records and traditions of the best breeders of La Perche has enabled the compiler of the Percheron Stud Book of France to trace definitely a large proportion of the most noted Percheron horses of modern times to this Arabian sire, that was imported about 1820. In fact, this Oriental blood, wherever introduced, in all nations and all climates, has been a powerful factor in effecting improvement in the equine race.

There is every reason to believe that this breed, like the draft breeds of England and Scotland, derived its size originally from the large Black horse breed of Flanders; but from the fact that grey has for many generations been the prevailing color it is evident that some very powerful agency has been at work, modifying the type until it has but little in common with this old parent stock except size. In Vol. I of the American Percheron Stud Book it is stated that:

> The little of history that can be found touching this breed definitely points to an eastern origin. Some French authorities date its beginning as far back as 732, when France was invaded by the Saracens, 300,000 strong, under the command of the famous chief Abdérame. The utter defeat and overthrow of this barbarian host by the French, under Charles Martel, on the plains between Poitiers and Tours, left the fine Arab and Barb steeds upon which many of the invaders were mounted in the hands of the victors; and these horses, crossed upon the large, strong native mares of that region, if they did not form the starting point for the breed which, since that time, has become so famous, undoubtedly had much to do with creating the foundation upon which it was ultimately built.
>
> Another large infusion of the same Oriental blood took place upon the return of the Crusaders, who brought with them many

of the finest of Arabian stallions; and these were also extensively used upon the already excellent stock of La Perche, and served to stamp upon them the form and other distinctive marks of the Arab to a still greater degree than they already possessed. The infusion of fresh Arabian and Andalusian blood was kept up for many years, at irregular intervals; the Lord of Montdoubleau, Geoffroy IV, Rotrou, Count of Mallart, Count of La Perche, Count Roger of Bellesmer, and many others of the nobility, having been distinguished for the importations made by them and the interest which they took in the subject of breeding horses; and as late as about 1820 we find that two famous Arabian stallions, Godolphin and Gallipoli, both grey, were imported and extensively used under the direction of the government. * * *

Aside from the history and traditions of the country the Percheron horse himself furnishes unmistakable evidence, in his form, disposition, color and general characteristics, that he is closely allied to the Arab. These characteristics have been materially modified, it is true, and the size has been greatly increased; but, in the hands of the excellent horsemen of La Perche, and under the careful and fostering supervision of the government, which exercised a direct control over the selection of sires, he seems to have retained many of the excellent qualities of his Oriental ancestry; and this, added to the greatly-increased size which had been attained, made the horses of La Perche many years ago the wonder of the world for their specialty of rapid draft—their ability to move a heavy load at a rapid gait.

It was this acknowledged superiority of the Percheron horse in the diligences, post-coaches and omnibuses of France that first caused the attention of the outside world to be directed to them. It was not simply as draft or cart horses that they were distinguished; on the contrary, had they possessed no excellence beyond this they would scarcely have attracted any attention; for other countries possessed horses that, for the purposes of heavy draft alone, were certainly their equals, if not their superiors; but it was in that happy combination of size and form, which gave them activity, quickness of motion, strength and endurance, that they were found to excel the horses of all other countries. * * * But, with the introduction of railroads, the use of the post-coach and diligence was practically

abandoned; and as this was the specialty for which the Percherons we have described had been bred, so, with the new order of things, came a demand for horses of larger type—greater weight, a heavier bone and more substance were required—and since that time the improvement of the Percheron in this direction has especially engrossed the attention of the French breeder. * * *

As the immense draft horses of the North (Flemish) were closely allied to, if not identical with, the large breed that prevailed in Normandy and La Perche prior to the modifications produced by the introduction of the blood of the Arabian and the Barb, heretofore alluded to, it was very natural that, when the Percheron breeders found it desirable to increase the size of their horses, their eyes should be turned towards this kindred race, from which other countries had already drawn so heavily for the same purpose. Accordingly, we find that mares in large numbers were taken from these northern departments, and from Belgium, under the various names of Belgians, Boulonnais, mares of Picardy, etc., and were bred to the stallions of La Perche. Stallions from the same countries were also extensively introduced, under various names, and of slightly differing types; but, notwithstanding the multiplicity of names arising from the different departments in which they had been bred, and the slight variation in form that existed, they were, after all, nothing more nor less than the Flanders draft horses—the same blood that had already exercised so potent an influence upon the horse stock of Great Britain.

The new infusion of this ancient kindred blood has been so general throughout the entire district which was once the home of the Percheron horse, that it is now difficult to find a pure Percheron as they were bred in that region fifty years ago. The old type that once made these horses so famous has been sacrificed to the demands of commerce for greater size; and for many years past it has been the chief aim of the Percheron breeder to produce a horse that should comply with this demand, without sacrificing the activity, hardiness and docility for which the ancient Percheron race was famed.

Subject to the change above alluded to, the Percheron is still extensively bred in the departments of Eure, Orne, Eure et Loir, Loir et Cher and Sarthe; and they have also found their way further north and toward the sea coast in the departments of

Seine-Inférieure and Calvados, embracing almost the entire ancient province of Normandy; but nowhere are they found so purely bred, and so nearly allied to the original Percheron type, as in the five departments first above mentioned—their original home. In that part of Normandy lying along the coast, especially north of the Seine river, the Flemish element seems to have made its influence more strongly felt, and there the horses possess more of the Flemish and less of the Percheron characteristics than those bred farther south, in the heart of La Perche; which will account for the diversity in the character of the horses brought to this country by our importers. Those who have purchased near the coast, or north of the river Seine, have usually obtained horses that leaned strongly toward the Flemish type. They are larger, coarser and more sluggish, with less energy, endurance and action, than those bred in Eure et Loire and the adjacent departments. They are better adapted to heavy draft purposes than their lighter, but more hardy, active and stylish relations of the interior, frequently weighing from 1,700 to 2,000 pounds in high flesh, and producing larger horses when crossed upon our common stock.

In the report which I made to the Department of Agriculture in 1883 of my observations on the live stock of Europe I spoke of the Percheron as follows:

I went first to the sales stables of Paris, fortified with what knowledge I had been able previously to obtain upon the subject, beginning with that of M. Vidal, a noted horse-dealer of Paris, who has undoubtedly sold more stallions to American importers than all the other horse-dealers of Paris combined. In reply to my question he said: "Fully ninety per cent of the horses that I buy to sell to Americans, for stallions, come from beyond Chartres, in the Perche; the others are picked up here and there, wherever we can find one good enough for the market; but we sell them all as Percherons." The other dealers all told substantially the same story. After spending a few days in Paris, talking with horsemen and gathering what information I could, I determined to see the Percheron breeding district for myself. All authorities agreed in pointing out Nogent-le-Rotrou, situated about one hundred miles southwest from Paris, in the ancient Province of La Perche, as the heart of the Percheron breeding

country. * * * On the day of my arrival at Nogent-le-Rotrou a large number of Percheron breeders had met to consult upon the propriety of establishing a Percheron Stud Book, in order to preserve the purity of the race and to protect themselves from unscrupulous dealers in Paris and elsewhere. I was much interested in the discussion which took place. The gentlemen present represented the principal breeders for some twenty or thirty miles around, and I was told that they owned at least one hundred stallions that had been kept for service this season. I questioned many of them. Among others the statement of Mr. Ernest Perriot, one of the most noted of the breeders present, is a fair sample of what all had to say. He is a very intelligent gentleman, and has sold many horses to American buyers. I should judge him to be about fifty years of age. His statement was in substance as follows:

I have been breeding horses right here all my life, and my father and grandfather were in the same business before me. We never breed or sell any other than pure Percherons. We have usually kept six or seven stallions each year for service. They travel around the country, serving mares owned by the farmers at about twenty-five francs each. We keep an eye on these mares, know where the best ones are, and when the foals are weaned we buy many of the best ones each year and keep them until we can sell them at a fair profit. I am sure there has been nothing but recognized pure Percheron stallions used in our stud since the time of my grandfather, and nothing else has been used in this whole Percheron region within my knowledge. There is a tradition that about the time my grandfather engaged in the business some Boulonnais blood was introduced into this country for the purpose of increasing the size of the Percherons, but certainly there has been none since about fifty years ago. The true Percherons will now average as large or larger than the Boulonnais. Neither Mr. Dunham, Mr. Dillon, nor any other American importer, has ever bought any Norman horses here. We don't have any such horses. You can see plenty of Normans in Paris; they are small horses, mostly bays, and are used in the cabs and carriages. They are generally half-bloods, got by English thoroughbred sires, and some of them are out of Percheron dams, and they are usually called Anglo-Normans.

The same statements, substantially, in regard to purity of race and the name, were obtained from all the breeders interviewed, notably Auguste Tacheau (Province of Sarthe), Pierre Sagot (Province of Eure et Loir) and Celestin Caget (Province of Orne). In fact, so far as I could learn, it was almost an insult to

ask one of the breeders present if he bred or sold any other than Percheron horses, and they spurned the term "Norman" with contempt. * * * It was an agreeable surprise to me to learn that so much pains has been taken by these Percheron breeders to preserve the purity of the race. I had often heard it asserted, even by some importers, that nobody knew anything about it; that the Percherons were mongrels, and that no man in France could give the pedigree of his horse. I found, on the contrary, that, while they have not paid much attention to preserving the maternal genealogy, many of the sires can easily be traced six or eight generations.

This breed has been extensively imported into the United States, and has been variously known as Percherons, Normans, Percheron-Normans, Norman-Percherons and French horses; and inasmuch as this multiplicity of names is very perplexing to the uninitiated, and has led to no small amount of controversy (not always in the best of temper), it is proper that certain well-established historical truths should be placed upon record in this volume for the information of such persons as may resort to it to learn the facts.

The first importations of these horses that attracted anything like general attention in this country were those brought to Union and Pickaway counties, Ohio, in 1851, and these were by their importers simply called French horses. Another importation to the same region followed in 1856, and yet another in 1857; but they were known only as French horses. In 1865 J. H. Klippart, secretary of the Ohio Board of Agriculture, went to Europe; and these horses having become very popular in that State he made their origin and history an especial object of study while in France. On his return he submitted a report to the Ohio State Board, in which he gave an exhaustive account of the horses of France, and stated that our so-called French horses were Percherons. In 1853 Col. Charles Carroll, of

Baltimore, Md., imported from France a stallion which he called a Percheron. In 1866 Mr. S. W. Ficklin, of Charlottesville, Va., made an importation of these horses, and he also brought with him the use of the name Percheron. The Hon. Wm. T. Walters, of Baltimore, Md., spent several years during and just after the close of our late war, in France, and while there he became so enamored of the Percherons that, returning in 1868, he brought with him quite a number of horses, which he called Percherons in this country. He also caused to be translated and published an interesting work entitled the "Percheron Horse," written by Du Huys, Master of the Horse to Louis Napoleon. This book, together with the writings of Mr. Klippart and Mr. Walters, and the usage of the importers before named, served to fix the appellation of Percheron quite firmly upon these horses throughout the middle and eastern States, so far as they were known. Twelve years prior to the first Ohio importation mentioned above Mr. Edward Harris had imported four horses from France which he called Normans. These horses were considerably smaller than the Percheron importations of a later date, and, although they were extensively noticed in the newspapers of that day, they failed to attract public attention to any considerable degree.

In the autumn of 1854 Louis Napoleon, one of the two French horses imported to Ohio in 1851, was taken to Illinois, and, in 1858, was sold to E. Dillon & Co., of Normal. This horse soon attained great notoriety, the Messrs. Dillon showing him and his get at many State and County fairs as Norman horses, and this name soon became quite generally applied to them in Illinois and the adjoining States. From 1868 down to the present time the importations of these horses have been very numerous, and importers and breed-

ers have used various names by which to designate them; some calling them Percherons, some Normans, and others combining the two names, some placing the Percheron first, and others beginning with the Norman.

Matters were in this shape when the movement for a stud book was inaugurated. At the first meeting called for that purpose, which was held at Chicago in February, 1876, and was attended by about a dozen persons, nearly all residing in central Illinois, it was voted to adopt the term *Norman;* and in pursuance of arrangements placed on foot at that meeting I was entrusted with the work of compiling a stud book of the breed. But when the book appeared, in September, 1876, contrary to the original plan, it was called a Percheron-Norman Stud Book. This action created a good deal of opposition from those who insisted on dropping the term Percheron entirely; and at the next meeting of the association, held after the first edition of the book was published, the subject was very fully discussed. This meeting was held at Peoria, Feb. 14, 1878, and was attended by nearly one hundred persons, about fifty of the number—representing eight different States and Territories—being active members of the association, which, at its former meeting, when the movement was inaugurated, only had a total membership of fourteen. The first motion made at this meeting was one by Dr. Ezra Stetson, to change the name of the association from "Norman" to "Percheron," which brought up the question of the name of the stud book, and I was called upon to give the reasons which induced me to depart from the original order of the society. In response to this inquiry I stated, in substance, that:

When, in pursuance of an arrangement with the society, I set about the work of preparing a record of imported French draft horses, fully intending to carry out the instructions of the society

in reference to the name, I was met at the very threshold by decided opposition on that point. I found the use of the term Norman confined exclusively to the west. The society which had inaugurated the enterprise comprised but fourteen members, and these nearly all resided in central Illinois, while those interested in these horses were scattered throughout all parts of the United States and Canada. The stud book, to be of any service, must be such as to command the support of all sections. More than half of those who were interested designated these horses as Percherons. Those east of Ohio used this term almost exclusively. In Ohio they were usually called French horses. In Illinois, Iowa, Wisconsin, and elsewhere in the west, breeders generally designated them as Percheron-Normans, or Norman-Percherons, in their advertisements, catalogues, etc., while the people in the west, in *talking* of them, almost universally called them Normans. In the literature of France they were always called Percherons, and so far as we had any literature in this country upon the subject the same name was used. I stated my conviction that it was the breed universally known and designated in France as Percherons that gave name and fame to the French draft horses that are imported to the United States. And that I had been very much disposed to drop the use of the term Norman entirely, and to call the book the Percheron Stud Book, several recognized authorities, notably Hon. A. B. Allen, of New York, and Hon. J. H. Klippart, of Ohio, having recommended that course. But, on account of the previous action of this society, and the extent to which the word had been used by breeders and others in the west, either by itself or in combination with Percheron, I felt that its rejection would work an injury to such as had advertised their horses exclusively as Normans, and would tend to increase the prevalent confusion. Accordingly I had adopted the compound Percheron-Norman as the only one that would give general satisfaction, in the full belief that my action would be endorsed by this society upon a presentation of the facts. In compiling this stud book I found myself acting for a constituency more than ten times as large as the association in its membership, and I had gone contrary to the instructions of the society at its inaugural meeting simply because I had felt myself obliged to do so in the interest of harmony and by a decent regard to historical accuracy. Before taking this action I had consulted with leading

members of the society, and I felt sure that my course would be endorsed.

The matter was extensively discussed by the members present, and finally by a unanimous vote my action was endorsed, the compound Percheron-Norman was adopted, and the name of the association changed to correspond with this action.

Very few were satisfied with this unwieldy compromise name; people continued to call them Percherons, French horses or Normans, as habit dictated, and the confusion continued as great as ever. Finally the organization of the Société Hippique Percheronne in France, in July, 1883, and the publication of the Percheron Stud Book of France, seemed to offer a simple and easy solution of the difficulty, and the American Society at its next meeting thereafter, held in November, 1883, wisely decided to adopt and adhere to the only name by which the breed is recognized in its native country. The name of the society and of the stud book was altered to conform to that used in France, and it is henceforth the Percheron Society and the Percheron Stud Book of America. At this meeting it was also ordered that no animals imported after Jan. 1, 1884, should be recorded in the stud book of the society unless previously recorded in the Percheron Stud Book of France. All draft horses imported as Percherons or as Normans prior to that date are eligible, and all animals bred in this country showing five top crosses to recorded stock may also be recorded. Foals from recorded dams, got by recorded sires, are also eligible.

This society, which was formed in February, 1876, is the oldest association of draft-horse breeders in existence, and its stud book, the first volume of which appeared in September, 1876, was the first stud book ever issued for any

breed of draft horses. Three volumes have been issued, and the fourth is now being prepared.

But there was always a party in central Illinois that opposed the use of the term Percheron as a name for this breed; and, notwithstanding the concessions made to them by the Percheron party at the meeting in Peoria in February, 1878, heretofore alluded to, in which they took an active part, they eventually decided upon a separate organization; and finally, about three years ago, they organized the "National Norman Horse Association," and began the publication of the "National Register of Norman Horses," two volumes of which have appeared. All draft horses imported from France are eligible to record in this work. At a meeting of this association, held at Chicago in November, 1883, it was voted that from and after Jan. 1, 1884, no imported horse should be registered that was not previously registered in the "Norman Stud Book of France;" but as there is no such stud book in existence, and as no such breed of draft horses as Normans is recognized anywhere in France, the absurdity of this regulation was so apparent that at the last meeting of the society, November, 1884, this action was rescinded, and the society resolved to ignore all French stud books and pedigrees, and decided to base registration, as formerly, upon the simple fact of importation.

The organization of the Percheron Society of France and the publication of a stud book for the breed in that country will doubtless do much toward preserving its purity; and if this book shall be honestly and carefully managed, as I have every reason to think it will be, it will afford a guarantee as to purity of lineage which has hitherto been sadly lacking. Most of the horses bought by American importers from dealers in the large cities of France have doubtless possessed a good share of Percheron blood,

but there has hitherto been no means of ascertaining the facts. Our importers have had to rely solely upon their own eyes and the integrity of French horse-dealers; and the dealers of Paris, Rouen, Dieppe and Havre are no more reliable and scrupulous than the average horse-dealer in other parts of the world. Those who have gone direct to the district which was once known as La Perche, now comprised in the Departments of Eure et Loir, Loir et Cher and Sarthe, where Percheron horses have for generations been bred in their purity, and where the fame of the Percheron race is still guarded as a priceless treasure, have always been reasonably sure of obtaining Percheron horses. But the Société Hippique Percheronne, which is managed by able men of high reputation, and under very strict rules, will hereafter furnish a directory of blood which few honest importers will care to ignore, and the result can not fail to add to the popularity of the breed in both France and America.

OTHER BREEDS.

There are several other breeds that should be noticed in detail, if it had been my purpose to include in this chapter a complete description of all the known breeds of the world, but I have chosen rather to confine it to such as are recognized and known in our own country. Among these I may mention briefly:

The *Suffolk Punch*, of England, especially distinguished as an agricultural horse in that country, uniformly of a chestnut or sorrel color, not so large as the Shire horses or Clydesdales, but compactly built, round-bodied, short-legged horses, rather light-boned for their weight, and with the general reputation of being rather defective in the feet, especially when used upon hard roads or stony streets, but in this respect greatly improved of late years. This is perhaps

the best established of all the heavy breeds of Great Britain, but they are not so universally popular even there as the Clydesdales and Shire horses. It is possible that the fact that other countries, especially our own, have not appeared to demand horses of this type has had something to do with their popularity in their own country. Very few of them have been brought to the United States, and such as have been imported appear to have attracted but little attention. A stud book has been instituted for this breed, and several volumes have been published within the past six years.

The *Boulonnais* is a heavy draft breed, found principally north of the river Seine, and near the sea coast in northwestern France, once the home of the old Flemish breed, and evidently possessing much of the old Flemish character. They are generally grey, like the Percherons, and are usually larger, coarser and less active than their relatives of La Perche; but there is no doubt of the fact that when the demands of commerce began to call for greater size and heavier bone than was characteristic of the ancient Percheron race, the Boulonnais blood was largely called upon to furnish it. Very little has been said or written about this breed, even by the French people themselves; but taking counsel from the example of their more enterprising neighbors of La Perche, those interested in the Boulonnais breed have set about the compilation of a stud book and a history of the breed. The author of that work, which we understand is about ready for the press, states in his introduction that the Boulonnais and the Percheron are the only breeds of heavy horses recognized in France. It is quite probable that many of the French horses brought to this country and sold as Normans or Percheron-Normans more properly belong to this Boulonnais breed.

The *Shetland Ponies*, too well known to need any

description in a work of this nature, take their name from the Shetland Islands, where they originated, doubtless through the effect of the bleak climate and scanty subsistence to which the original specimens of the race have been for ages subjected upon these islands. They are also bred in considerable numbers in the north of Scotland. There are other comparatively diminutive races, as the Welsh or Exmoor ponies, the Norwegian ponies, and others of Europe and Asia, but a description of each and all of them would be more interesting to the student of natural history than to the practical American breeder.

The *Mustangs*, or wild horses, that were found upon the plains of Texas and New Mexico, and elsewhere on our own continent, are a tough, hardy and usually ill-tempered race of small horses, remarkably agile and sure-footed, and have descended from the original Spanish stock brought to Mexico by the Spaniards in their early efforts at the conquest of that country. The Indian ponies, so common in our western Territories, have undoubtedly the same origin, and many of them, especially those that have been bred in the higher latitudes, approximate very closely the form and size of the Shetland pony. The hardiness and powers of endurance of many of these horses are simply marvelous; but these valuable qualities are largely neutralized by ill-temper and lack of size. Thoroughbred sires, as well as stallions of the various draft breeds, have been used upon these mustang mares with excellent results in most cases. When tamed and broken they are especially adapted for use in herding cattle upon the great ranches of our western plains, and for this purpose the genuine mustang is the chief reliance of the herdsman. They are bred, herded and branded in about the same manner as that practiced by our western ranchmen with their immense herds of cattle.

CHAPTER III.

STALLIONS, BROOD MARES AND YOUNG FOALS.

If the reader has given any thought to the general subject of stock-breeding he must be well aware of the fact that he can not gather grapes from thorns nor figs from thistles. The general principle that "like produces like" is true throughout all animal and vegetable life. Everything brings forth after its kind. We sow pure seed and expect the produce to be of the same kind. Wheat does not produce rye, neither will oats produce barley. The rule is just as true in animal life. The great principle that each begotten creature is but the sum or essence of what has preceded it admits of very few exceptions. We have only to apply this general principle, with a knowledge of the special characteristics of the various breeds and families of horses, as portrayed on the preceding pages, and the business of breeding horses of any given type becomes greatly simplified. No man would breed to a Shetland pony with the expectation of producing a draft horse, nor to the ponderous Shire or Clydesdale with the hope of the produce turning out a winner on the race course. The general characteristics of the breed to which the parents belong will be transmitted to the progeny; and in proportion as the breed is firmly established and uniform in its characteristics so will the produce be uniform in its character. Whatever has been "bred in the bone" will be

transmitted. A pair of Shetland ponies will produce a Shetland pony with unerring certainty; because in all the characteristics which distinguish the ponies from other breeds of the horse kind they are uniform; but we can not count with certainty upon the color of the hair or the individual peculiarities in many minute details, because in these minor points uniformity in the race has never been established. But whatever has been firmly fixed as a characteristic of the breed, whether it be peculiarity of gait, form, color, size, disposition, or speed, will be transmitted with a certainty in proportion to the degree of uniformity which has been attained in that particular in the ancestry.

I have often referred to the heterogeneous character of the horse stock of our country, which is a conglomeration of every breed and type of the horse kind in the known world. Until very recently no intelligent effort has been made to keep any of the breeds pure except the thoroughbred. We have crossed in and out without rhyme or reason until, with the single exception of our thoroughbred horses, it is scarcely possible to trace the pedigree of any given animal four generations back without finding an admixture of all the various breeds and types that have ever been known. With such an ancestry it is not to be wondered at that disappointments meet the novice on every hand. He selects a fine-looking bay mare that will weigh nearly 1,500 lbs., in moderate flesh, clean-limbed and strong, and he looks about for a stallion possessing the same characteristics that he may couple the two together to produce a first-class draft horse. He has been told that "like produces like" so often that he believes it; and this theory leads him, very properly, to think that from such a pair his hopes of producing good draft horses will be realized. But he is disappointed; the produce is not like either of the parents;

and he pronounces breeding a lottery, and the doctrine of the transmission of the peculiarities of the parents to the progeny a humbug. He forgets that heredity transmits with certainty only what has been firmly fixed in the ancestry; and he loses sight of the fact that his large, fine bay mare was herself the produce of a mixed ancestry—perhaps of a bay Clydesdale stallion and a little sorrel mare of unknown blood, and that his stallion was probably got by a half-blood French draft horse, out of a dun pacing mare, whose dam in turn was a Mexican mustang. The possession of the desired qualities in the sire and dam selected was an accidental circumstance; and intelligent breeders, with a knowledge of this fact, would not expect that these accidental qualities would be transmitted with certainty.

SELECTION OF BREEDING STOCK.

In the application of these general laws which govern the transmission of hereditary qualities to the business of breeding horses the first step is for the breeder to decide, in his own mind, what sort of horse he wishes to produce. If his fancy or interest leads him to breed horses for the race course he must keep constantly in mind the fact that for this purpose, whether for running or trotting, speed and endurance of the very highest order are indispensable; and here the least unsoundness will prove fatal. In order to live through the severe ordeal of training, and the still more trying one of the bruising campaign, which taxes the utmost powers of the horse day after day, there must be no weak spots in his composition. There must be no soft, spongy bones and joints; no brittle or contracted feet; no tendency to curbs, spavins or ringbones; no weak tendons nor feeble lungs in the horse that is to prove a profitable campaigner. No matter how much of mere speed the get

of any stallion may have shown, if, as a rule, they have proven seriously defective in any part of their machinery, he should be avoided as a sire by those who are breeding for the turf, whether runners or trotters; for the race course will speedily search out and bring to light the least taint of unsoundness or weakness in any part of the organization. Feet and legs, and bones and tendons, and joints and muscles, and heart and lungs, and brain and eye, must each do its part thoroughly in the great race horse. There must be that nice adaptation of the machinery, and that firmness and fineness of texture in the material of which the machine is built, which shall enable it to withstand the tremendous strain that is put upon it, and which distinguished the great campaigners, like Lady Suffolk, Flora Temple, Goldsmith Maid, English Eclipse and his great American namesake, from the flashy ones that blaze out for a single season like a brilliant meteor and then sink into obscurity.

It is this perfection of organism which enables the horse to stand up, under preparation and training, year after year, profiting by his education and improving with age, that makes the really valuable turf horse. It is a quality more valuable than speed, because whatever measure of speed it possesses can be depended upon and improved. In short, it is the quality which distinguishes the thoroughbred from the dunghill; the great race horse that, like a Goldsmith Maid or a Lexington, will always be in condition to struggle for a man's life, from those band-box race horses and newspaper trotters that are never heard from outside of private trials and breeders' catalogues.

These are the considerations that should influence breeders of horses for the turf; and no blind devotion to a fashionable pedigree, nor mere promise of speed in the youngsters got by any stallion, should induce us to over-

look a prevailing tendency to any unsoundness or lack of endurance in his get. The number of heats and races won, and the number of successful years upon the turf, are more reliable lamps by which the breeder may guide his footsteps than the record of colt stakes and mere tests of speed.

The ordeal of the race course, and more especially the trotting course, is very trying upon the legs and feet, and here soundness and quality of the highest order is essential. The turf horse that is always troubled with "a leg" is a nuisance. Curbs, spavins, ringbones, weakened or sprained tendons, "bucked" knees and stiffened joints are some of the troubles that affect the legs of the horse and greatly impair his usefulness.

The indications of a good leg are firmness, hardness and smoothness to the touch, showing an entire absence of adipose tissue; large, well-defined joints, entirely free from abnormal appendages; firm, but elastic, cords; a short pastern, short from knee and hock to pastern-joint. The shape of the bone should be broad and flat, and the legs should stand squarely and firmly under the horse, the toes turning neither in nor out. The bone should be of good size just below the knee, and flat; but large-sized canon-bones, with strong, clean back sinews and suspensory ligament are of great importance. "Curby hocks," "cow hocks," "bowed legs," "calf knees" and "over on the knees" are indications that are always unfavorable.

All these points are to be examined mainly when the horse is not in motion; and when fully satisfied in these particulars it is very essential to see that, having four good legs, the horse has the ability to use them properly; that he steps with a firm, free, elastic tread; that the legs and feet do not get in the way of each other when he is in motion,

but move freely, without interference, and yet without any paddling or straddling motion. Stiffness of the joints will be most readily detected by causing the horse to step backwards, and by seeing him in motion when first taken from the stall, before he has been warmed up.

The feet, are, of course, a very important appendage to the legs. In shape, a medium between a flat foot and a mule-shaped one is to be preferred; and it should always be of good size, with a large degree of concavity in the bottom. The frog should be full and lively, free from thrush or canker; and the hoof must be hard and elastic, without cracks, and free from brittleness.

If all these details were looked after by breeders in selecting brood mares, as well as stallions, we should soon note a marked improvement in the legs and feet of our horses; for there is not a single good point or defect among those above enumerated that is not liable to be transmitted to the offspring. It is too often the case that mares especially, after having broken down through some inherent defect in the feet or legs, so that they can no longer be profitably used, are relegated to the breeding stud to transmit again the malformation that made them worthless to their progeny. Like does not always beget like in every feature and detail, but in general terms the saying is a true one, and defects are just as likely to be transmitted as good qualities. Mares or stallions disabled or crippled by accident, and not from constitutional tendency or weakness in any particular, may be safely used for breeding purposes; but those that have given way through weakness or defects in any part of the animal machinery should always be rejected. Breeders of trotting horses have been especially neglectful of these sound principles, and thousands of mares with some speed, but with legs and feet so unsound as to

cause them to break down under very slight training, have been used for breeding purposes.

And so with any other form or type of horse that may be mentioned. If draft horses are desired select breeding stock from some of the best-established draft breeds. The distinguishing characteristics of weight and strength—which are the chief essentials in a cart or draft horse—are quite firmly fixed in the Clydesdale, the English Cart horse and the Percheron, imported to this country from Europe, however much they may differ in other particulars; and they may all be relied upon, with a good degree of certainty, to reproduce their kind when judiciously coupled. But to this must be added docility, soundness and endurance. Given all these qualities, and then the more of action and style the animal possesses the better. He may be in possession of all these characteristics except the first, but being deficient in that he is not a good draft horse. On the other hand he may weigh a ton, but if he be ill-tempered, unsound or lacking in endurance his value is materially lessened. He may possess all the good points above enumerated, and yet be so deficient in energy and so heavy and sluggish in his movements as to come very far short of a perfect draft horse. Each of these qualities being desirable, it follows that the horse possessing all of them in the highest degree is the most desirable one. I do not propose to enter into a discussion as to the comparative merits of the various draft breeds. All have crossed kindly with our native mares, and all have marked substantial improvement, at least in the *size* of our draft stock, and some of the very best results have been attained by a commingling of the blood of two or more of these imported strains.

I do not believe it is possible that a horse can be bred combining all the desirable qualities; the horse-of-all-

work is a myth that can not be realized. The general farmer needs a horse that combines a good degree of both action and weight, but the horse that suits *him* is not the heavy draft horse that is required in the trucks and drays of our cities, the demand for which is at present very imperfectly supplied. On the other hand there has always been, and always will be, an active demand for fast road horses, too light for general farm work, and with speed, style, docility and endurance as the qualities principally sought after. Each of these types it will pay to breed, just as it pays to raise the various kinds of grain; but if all the resources of our country were directed toward producing wheat to the neglect of other grains we should very soon find the market overstocked and the business unprofitable. And so, if everybody catches the draft-horse fever we shall, after a while, have an oversupply of heavy horses and prices will go down. There is room for all, and a steady demand at good prices for good specimens of each type of horses; and breeders of the best of any breed need have no fears of a serious decline in price.

There are several styles of horses that sell well at present; and, in the breeding of any of these, farmers may, under favorable circumstances, engage, with a fair prospect of finding the business profitable. First, and highest-priced, are the very fast trotters and runners; but these very fast ones are not produced with certainty by even the most experienced breeders, with the best of breeding stock to work upon and the best of trainers to develop them. But there is a fascination about it which attracts many gentlemen of wealth and leisure to the business, the question of profit and loss being with them a secondary consideration. It affords them enjoyment and recreation, and it is indulged in mainly to that end; and into such

hands the breeding of horses for speed alone, whether runners or trotters, should be left.

The next class, in the scale of prices, is the large, stylish, high-stepping carriage or coupé horse. Such horses may be bred with a good degree of certainty, with the proper stock to breed from, and there is but little expense attending the breaking and training. Such as prove rather deficient in size, style and action may make very serviceable farm horses; but to command the best price for the carriage or coupé there must be rather more of spirit, and they must be rather more "rangy" and "leggy" than is desirable for the farm. Such horses may be produced by coupling large, stout mares with a good-sized, highly-bred, stylish, high-stepping trotting stallion, or a stylish, large thoroughbred. The latter is the course of breeding by which the so-called coach horses of England are usually produced. For the better class of horses of this type there is an almost unlimited demand, and they could be raised in this country and exported to England at a very handsome profit. If thoroughbred or very highly-bred mares are used to produce such horses, I would recommend the use of a well-bred trotting sire always; and even with cold-blooded mares deficient in trotting action the trotting sire should be used. But if the mares are low-bred, and yet possess a fine trotting gait, I should, as a general rule, prefer a thoroughbred sire, the object being to combine, so far as is possible, size, style and fine, high-stepping action.

Another class of horses, for which the demand is almost unlimited, is the blocky, compact, low but quick-stepping and active draft horse. For use on our farms and for our city street-cars they are wanted of from 1,100 to 1,300 lbs. weight. For our omnibuses and express wagons the de-

mand is for the same style of horse, but heavier, weighing 1,300 to 1,500 lbs., while for carts and for heavy freighting they can scarcely be too large, provided they are sound, hardy and active. The great trouble with horses of this class is a lack of endurance. Too many of them have broad, flat, brittle hoofs, or the opposite extreme of contracted, narrow heels; both are to be avoided. Many of them have unsound joints, especially the hock joint; and the bone is round, beefy, and of a coarse, porous nature. In selecting breeding stock to produce this class of horses especial regard should be had to these points. The hoof should be of good size—neither flat nor contracted at the heel. The legs should be clean and flat; the joints firmly corded, free from curbs, spavins and beefiness. The flank should be full and low, for that indicates a good feeder. The chest should be wide and the girth large, for that indicates lung-power and what is termed "constitution." The fore legs should set *under* the horse, and not be stuck on the outside, "like a pin in a log." He should be short on the back, long on the belly, slightly arched at the coupling, ribbed up closely in the flank, heavy-boned, short-legged, compact, blocky, gentle, good-tempered, active, wide-awake, but not nervous or restless. Such a horse will *sell*, and sell *readily* at all times and at a good price, no matter what his color may be; and his price will increase in proportion to his size, from 1,100 lbs. up to 1,700 lbs. The general farmer can not afford to breed for speed; he must leave that to gentlemen of means, who, with the choicest brood mares as well as sires, and with every appliance for successful training, can engage in the lottery of breeding for speed, because he can afford to take the chances, and because he finds a considerable portion of his reward in the relaxation from other cares which this business affords. But the general

farmer must raise horses that he can sell. He must do the work of the farm mainly with mares that, while performing their labor satisfactorily, will each year produce colts which at four or five years old will be salable horses. He must keep such brood mares as, when coupled with good stallions, will invariably produce horses that answer the demands of commerce.

There is no practical difficulty in breeding horses of this class. If the mares be quite large, with a dash of good blood, they may be coupled with a well-bred, large trotting stallion or thoroughbred with a considerable degree of certainty that the produce will be good coach or carriage horses, that will sell. But, as a *general rule*, our western farmers, with their miscellaneously-bred mares, will be most successful if they confine their breeding to draft horses. With good French, English or Scotch draft horses for sires, seventy-five per cent of the foals from ordinary mares will make horses that, in fair flesh, will weigh 1,400 lbs. or over at maturity; and such horses, unless seriously defective, will sell at good prices. There is no expense for training; the colts are broken by the farmer in doing the farm work, and, as soon as they are *old* enough, they are ready for the market; and such horses can be raised as cheaply as a steer to the same age. It will cost a little more at the outset for the service of the stallion, because good, imported horses, such as I have described, can not ordinarily be bought for less than $2,000, and such stallions can not be kept at less than $20 service fee. But this small additional outlay is scarcely worth taking into account, when it makes all the difference there is between a colt that will sell, as a four-year-old, for $150 or more, and one that can not be sold at all.

I have said that the best available means for producing such horses in this country is by a cross of the Percheron,

the Clydesdale or English Shire stallion upon our common mares; but good judgment must be exercised in the selection of a sire. Many of those imported are unworthy of the name—they have been brought here because they could be bought cheaply and afforded the dealer a better margin for profit than a higher-priced horse. The time has gone by when the mere fact of *importation* should sell a horse or commend him to patronage. *Defects* are quite as likely to be transmitted as good qualities, and breeders must learn to discriminate closely if they would breed successfully any class of horses.

Many people imagine that there is some great mystery —some occult science—involved in the selection and management of horses for breeding purposes, but there is nothing of the kind about it. It is only the application of good, common sense and perfect familiarity with the points of a horse, joined to a thorough knowledge of the best methods of feeding and managing horses in general; because the rules that apply in the selection of a foal that is designed to be used for breeding purposes, so far as the appearance of the animal is concerned, are precisely the same as if it were to be selected for other uses; and the general rules for the feeding, breaking and training for other purposes apply here as well.

I will presume that the breeder has definitely decided in his own mind what breed or strain or family he proposes to select from. He ought then to try to find a colt that has the longest possible ancestral line uniformly distinguished for the quality upon which he bases his selection, and then he should look carefully to see that no constitutional infirmities have been inherited. If there is blindness—not the result of accidental injury—in the near ancestry, although the colt himself may be apparently free from any defect in

his organs of vision, it is a point against him. And so of any other constitutional defect, weakness, or infirmity, whether of form, structure or disposition. Infirmities of temper are especially liable to be transmitted. It is very desirable that the breeder should know, to the minutest detail, the character of the ancestry on both the paternal and maternal sides; and the farther back they can be shown to be free from constitutional defects of any kind the better. The colt may himself be free from any serious defects; but if they are known to have existed in his near ancestry there is always more or less danger that he will transmit them to his progeny. Every observant horseman of experience can call to mind numerous instances confirming the truth of this position. The writer once owned a grey stallion that was got by a grey stallion, out of a grey mare. When placed in the breeding stud it was found that he quite often got dun colts, even out of grey mares. Investigation into the ancestry of this horse developed the fact that his second dam was a dun mare. Here we had the inherited quality of color lying dormant through two generations, and reappearing under the most unexpected circumstances in the third.

But while all these points are important it may not be out of place to remind the reader that the man who expects to find all the good qualities and perfect immunity from fault of any kind, in any one animal, will look a long time in vain. This ideal can only be approximated, never reached, in any race or breed.

GENERAL MANAGEMENT OF THE STALLION.

The most frequent mistake made by inexperienced persons, and even by many who ought to know better, is the endeavor to have the stallion in fine show-condition by the

time the season opens. To this end various drugs, nostrums and roots are recommended; the horse is kept carefully housed and closely blanketed; he is loaded with fat; his muscles become soft and flabby for want of exercise, and, although he may come out in the show yard at the opening of the season, looking "as sleek as a mole," and apparently in the very pink of condition, he is in reality not nearly so well fitted for service in the stud as he would have been had this fitting-up process been entirely dispensed with.

It may be laid down as a general rule, that a healthy horse needs no medicine whatever to put him in condition for the stud. The whole secret of successful preparation lies in a few words. Let him be well and regularly fed on healthy, nutritious food, with plenty of exercise every day, to keep his muscles firm and hard, and let him be well groomed, so that his coat may present a fine appearance. The skin should be kept thoroughly clean by occasional washing and frequent brushing and rubbing. The mane and tail should be especially looked after, with reference to cleanliness of the skin. If very dirty, soap may be freely used in the cleansing process; and when this is faithfully attended to there will be but little danger of having a fine tail or mane ruined by rubbing.

The food should mainly be good, sound oats—nothing is better; but this should be varied by an occasional ration of corn or barley; for horses, like men, are fond of variety in their food, and an occasional change of diet is conducive to health. Wheat bran is an invaluable adjunct to the grain ration, and can never be dispensed with. It is the cheapest, safest and best of all regulators for the bowels, and it is especially rich in some of the most important elements of nutrition. No specific directions as to the quantity of food

can be given. Some horses will require nearly twice as much as others; and the quantity that may be safely given will depend somewhat upon the amount of exercise in any given case. Some horsemen recommend feeding three, and others four times a day; but in either case no more should ever be given than will be promptly eaten up clean. If any food should be left in the box it should be at once removed and the quantity at the next time of feeding should be reduced accordingly. As a rule, it will be safe to feed as much as the horse will eat with apparent relish; and then, with plenty of exercise, he will not become overloaded with fat. The hay, as well as the grain feed, should be sound and free from mould and dust, and the stall should be kept clean, well lighted and perfectly ventilated.

The amount of exercise to be given will vary somewhat with the condition and habit of the horse. If he be thin in flesh, and it is thought best to fatten him up, the exercise should be lighter than it otherwise would be; and, on the other hand, if there is a tendency to become too fat this may be corrected by increasing the amount of exercise that is given. Draft horses should rarely be led or driven faster than a walk in taking their exercise, and they will require much less of it than the roadster or the running horse—a moderate "jog" daily will benefit them. I am clearly of the opinion that in no one particular is there more faulty management on the part of lazy grooms and stable hands than in the matter of exercising stallions while doing service in the stud. They should not be walked nor jogged so long that they will become jaded or wearied, but should have enough of it daily to keep the muscles hard and firm, the appetite good and to prevent them from laying on an undue amount of fat. No draft horse, under ordinary circumstances, should have less exercise than five miles a day, and the

roadster and running horse may safely have six miles, which in some cases should be increased to eight or even ten.

The point to be aimed at in the stable management of the stallion is to so feed, groom and exercise as to keep the horse to the very highest possible pitch of strength and vigor. The idea which prevails among many stable grooms that feeding this or that nostrum will increase the ability of a horse to get foals is sheer nonsense. Anything that adds to the health, strength and vigor of the horse will increase his virility or sexual power, simply because the sexual organs will partake of the general tone of the system; and, on the contrary, whatever tends to impair the health and vigor of the general system will have a deleterious effect upon the sexual organs. A healthy horse needs nothing but good food, pure air, plenty of exercise, with due attention to cleanliness and regularity in feeding and watering; and when all these things are attended to properly the drugs and nostrums that stable lore prescribes as "good for a horse" would better be thrown to the dogs.

For the use of the stallion I like a box stall not less than twelve by eighteen feet, without any manger or rack whatever for the hay, and with a box snugly fitted in the corner for the grain. Many prefer that the feed boxes should be entirely detached from the stall, to be removed as soon as the horse is done eating. The hay is put on the floor in one corner of the stall, and thus there is nothing—no projections, boxes, racks, mangers, sharp angles, etc.—upon which a spirited, restless horse may injure himself. If, in addition to these precautions, the sides of the stall be lined all around—doors and all—with stout boards, standing out at the bottom about one foot from the wall, and sloping upward and towards the wall for a height of three

and a half feet, you will have a stall in which it will be well nigh impossible for a horse to injure his mane or tail by rubbing. In such a box the horse need not be kept haltered, and the owner may feel assured that the liability to injury is reduced to a minimum.

One of the most pernicious and dangerous of all practices, especially among breeders of draft horses, is that of over-feeding in order to produce great weight. Draft horses are not exactly bought and sold by the pound, like hogs and steers; yet frequently the first thing one of these draft-horse breeders will speak of is the weight of his horse. "That stallion weighs 1,900." "This filly weighed 1,400 at two years old," and similar remarks are specimens of the "horse talk" most common among breeders of draft horses; and they feed to produce *weight*, just as the man does who is feeding hogs or cattle for pork or beef. It is an easy matter to add 200 pounds weight to a fair-sized horse when in ordinary flesh; and a draft horse that has less than two inches of adipose tissue on his ribs is not fit to show anywhere—at least so the fashion runs.

It is not strange that horses so overfed and loaded down with fat should be unable to work in warm weather, or that their reputation for endurance should suffer. A good roadster weighing 900 pounds when in condition for work will make his mile in 2:30 or go for hours at the rate of ten miles per hour; but load the same horse with fat, until his weight is 1,200—which can easily be done—and you can "break his heart" in three minutes on the road. Goldsmith Maid was a marvelous trotter, and her easy, cat-like strides carried her to the front in 2:14, when she was in good condition to trot; but if she had been made as fat as a show-yard Clydesdale, she would have waddled like a duck, and a "four-minute horse" could have beaten her.

Endurance, as well as procreative powers, are largely matters of *condition*, and draft-horse breeders seldom have their horses in that condition which is favorable to great excellence in either. For the reputation which has, to some extent, attached to them as soft and unable to stand up under hard work, and as being rather uncertain foal-getters, the breeders of these horses have only to thank their own pernicious system of extravagantly high feeding; and unless they abandon or considerably modify their position in this regard the reputation of all our draft breeds is likely to suffer still further. Liberal, and even generous feeding, with plenty of exercise, is necessary to perfect development; but feeding horses as we do hogs or steers, merely with a view to adding so many pounds to their weight, is a pernicious custom, and should be condemned.

A well-informed writer in the *North British Agriculturist* some years ago animadverted very severely upon this pernicious system of overfeeding, which prevails in Great Britain to even a greater extent than in this country; and his remarks are so pertinent that I quote from the article as follows:

The number of useful horses sacrificed to forcing and feeding for show and sale appears to be on the increase alike in England and Scotland. Old Citadel, and other frequent prize-winners among thoroughbreds, hunters and cobs stand the wear and tear of show-yard preparation better than most of the agricultural horses. A considerable number of promising young cart horses and mares at the Royal Meeting at Bristol were overlaid with beef and fat to the detriment of usefulness and soundness. Abundant illustration of the evil is seen at every large show. Several of the Bristol contingent were sadly gummy and itchy about their legs; several were puffed and full in their hocks, looking as if they had been strained, and had got both bog spavins and thoroughpins; from the same senseless high feeding several had early developed sidebones. Yet, even with these notable

defects—doubtless regarded by the judges as temporary, and not hereditary—several horses at Bristol managed to gain the coveted rosettes. Can judges and stewards at important meetings do nothing to carry into effect the sensible rules generally laid down in their printed programme as to overfeeding, but systematically ignored? Can not symmetry, style and usefulness be fairly estimated without dangerously overloading the animal with beef and fat? Should it be essential to the successful exhibition of a good horse or bull that for months he should drink, as many do, two or three gallons of cow's milk daily? This artificial treatment greatly improves the looks of plain, flat-sided, weak-loined subjects; but it can not give the essential shape, style and action, and besides the ailments already mentioned it engenders in horses, as in other animals, liability to anthrax or blood poisoning, of which quarter evil and splenic apoplexy in cattle are the most familiar examples. Many gross overfed horses suffer from similar conditions; they take what at first appears to be a simple cold; the throat becomes very sore, congestion, rapidly followed by extravasation of blood, occurs throughout the lining membrane of the air passages; treatment in such gross overfed subjects is singularly unsuccessful, and in fifteen or twenty hours the patient dies, suffocated from pulmonary apoplexy. Among the young horses got up for town sale, as well as those sacrificed to showing, it is wonderful to observe the amount of fat laid on, not only externally, but around the internal organs. The omentum of a four-year-old cart horse is sometimes overlaid with four or five inches of firm fat. Heart, kidneys and other organs are proportionally loaded. Amidst the fibres of the heart and other muscles the enfeebling fat is also laid down, interfering with muscular capability. Woe betide the unfortunate animal which, in such a state of obesity, is put to severe exertion. Sudden death may result from the giving way of some organ or vessel weakened by the fatty degeneration, or dangerous disease of the air passages or laminitis is established; whilst eight or ten months of careful feeding and regulated exercise are required before such an overfed horse is fit for really hard work. Surely the reprehensible fashion of forcing and overfeeding animals intended for work or for breeding should be held somewhat in check by the consideration of the dangers of such a practice, and by its serious interference with successful breeding!

It has been noticed that draft stallions imported to this country are frequently troubled with what appears to be chronic grease or scratches, which causes ugly, itching sores on the legs; and, so far as my observation goes, the horses thus attacked have almost universally been such as have been kept in very high flesh, with but little exercise. From this fact I several years ago adopted the theory that this diseased condition was usually the result of the course of feeding and management pursued, and that no treatment would avail to cure the disease so long as the cause remained.

Acting on this theory I undertook the treatment of a stallion that was affected as above described. Commencing soon after the close of the season, he was turned out in a small pasture lot, which was so securely fenced that there was no possibility of his breaking out. From this time on, so long as the grass remained good, no other food was given him. His stable door opened into this pasture, and it was at all times left open, so that he could go in and out at his pleasure. When the grass began to fail, on the approach of winter, he was given each day as much corn-fodder as he would eat, but no grain whatever; always giving him the run of the pasture. This treatment was kept up until the 1st of February, the horse being confined to his stable only during the night, and not then except in extremely cold or stormy weather. He was thus kept about four months without any grain whatever, but with all the corn-fodder he would eat, after the grass failed. As a result of this treatment, without the administration of medicines of any kind, he was completely renovated and cured, and no symptoms of the disease ever appeared afterwards.

Another case, which affords a striking practical illustration of the effects of overfeeding and lack of exercise in

the stallion, is that of an imported Percheron stallion, owned for many years by the late Hon. Z. T. Chandler, of Michigan. In July, 1876, the man in charge of Mr. Chandler's stables wrote me concerning the horse as follows:

This horse was imported to Baltimore in 1868. Two years after he was purchased by Mr. Chandler and sent to this farm, where he has ever since been. But he was put under very bad management—kept in his stall, with very little exercise, sometimes for months not stepping out of his stall, not even to be watered, loaded with fat—and of course he became a very uncertain foal-getter. He came into my charge late in the spring of 1873 in this condition. That season he only got seven colts, three of which died from premature birth. After the season was over, not believing in that way of treating a stock horse, I put him into the team, worked him steadily, fed sparingly, got his flesh off from him, brought him to the next season in spare flesh, hard as a plow-horse, required his groom to give him at least twelve miles of good active motion a day, and he produced that season a very fair proportion of colts. I have continued to handle him in the same way, and he is now about to close his season, having booked a hundred mares, very few of which have been returned to him. His flesh is as hard as that of a plow-horse; indeed he is able, if I chose to put him to it, to go into the plow, and, to all appearance, do the best day's work of his life.

CONTROLLING THE STALLION WHEN IN USE.

While the temper and disposition of the stallion are largely matters of inheritance, yet much depends upon the breaking and management. It is easier to spoil a horse than it is to cure him of bad habits, after these are once formed. If there is any appearance of a disposition to be "headstrong" and unruly he should never be led out except by a bridle that will enable the groom to exercise the most perfect control over him. The one that I have found most effectual is made by taking an ordinary "snaffle" bit, with rings of moderate size, and with the head-piece made

in the usual way; get a blacksmith to attach a well-polished, round iron bar to the right hand ring, by means of a small link connecting the bar and the ring; to the other end of the bar attach the usual sliding rein used on stallion bridles. Put the bridle on the horse in the usual way, and then, with the right hand on the bar and the left on the bridle-ring next to you, press the bar back and the ring forward until the bar will pass through the ring in the left hand. This bar should be made just as long as it can be to admit of its being passed into the other ring in this manner, and the bit and rings should be so adapted to the size of the mouth and under jaw that, when a little pressure is brought to bear upon the rein attached to the end of the lever formed by this iron bar, the rings of the bit will be brought within an inch of touching each other. The leverage given by this appliance, when well fitted, will enable anyone to hold the most unruly and headstrong horse in check. It is not necessarily severe when the horse behaves himself, and when he is not disposed to do this he can very suddenly be brought back on his haunches by a moderate touch on the rein. When the bar is not needed the rein to which it is attached may be passed over the head and down through the ring on the near side, instead of under the jaw. I have described this device fully because it is cheap, simple and effective, and yet it does not appear to have been extensively used.

It requires some skill and a good deal of patience to teach a stallion how to behave himself properly when brought out to serve a mare. He should never be allowed to go onto her with a rush; but he should be led up on the near side of the mare to within about ten to fifteen feet of her, and made to stand with his head towards the mare, about opposite her head; and when he is ready he should

be led towards her, and made to commence the mount when at her side, instead of going for a rod or so with his fore feet sawing the air, as is often the case. By observing these directions there will be but little danger of injury to the stallion by a kick from the mare when he is mounting, especially if a good man is at her head to prevent her from wheeling towards the horse when he approaches. The danger to the horse is always greatest when he is coming off, because many mares will kick then that will stand perfectly still when he is mounting. To obviate this it is always better for the groom who holds the horse to seize the mare by the bits with his left hand at this moment and bring her head around towards him by a sudden jerk as the horse is coming off.

But in most cases, indeed in *all* cases where there is not an absolute certainty that the mare will stand perfectly quiet, the hobbles should be used, and then there can be no danger. To make these, prepare two straps of very strong but soft harness leather, two inches in width, and long enough to buckle comfortably around the mare's hind pasterns. The buckles must be strong and well made, and in each of these straps there should be sewed a strong, flattened ring. Next prepare a collar-piece of two-inch leather, and about as large as an ordinary horse collar, so that the mare's head will readily pass through it; to this collar fasten securely two stout straps, each an inch and a half wide, and just long enough to pass down between the fore legs and reach the straps on the hind legs; attach stout buckles near the ends of these straps, but far enough from the ends to leave room to adjust them to different-sized mares; buckle these straps to the rings in the straps that are fastened to the hind legs, and buckle up short enough to effectually prevent the mare from kicking, if she should be disposed to do so.

All this can be adjusted in a moment's time, and by its use all danger from kicking is avoided.

WHEN MARES SHOULD BE TRIED.

A point upon which there is great diversity of opinion is when and how often a mare should be tried after she has been served by the stallion. A mare will almost invariably be "in heat" on the ninth day after foaling, if she is healthy and has received no injury in giving birth to her foal; and in most cases it is best that she should receive the horse at that time, if it is desired that she should be kept for breeding purposes. I can remember when it was the almost universal custom to try mares every week after they had been served, but that is not the present practice of experienced horsemen. The rule that now receives the most general sanction is, not to try the mare again after service before the lapse of two weeks. I have taken a great deal of pains during the past four years to ascertain the views of prominent, intelligent and experienced breeders upon this point, and I find them, with very great unanimity, agreeing that after the ninth day from foaling there is no regular period for the return of heat, neither is the period uniform in duration. Some mares will appear to be in heat nearly all the time, while with others it recurs but rarely and lasts but a very short time; consequently if the mare, after service, goes out of heat within a few days she should be served when she comes in again, even if that should be within nine days; but should the period not pass off she should not be served again under eighteen days. As a rule, it is best to try the mare again within from two weeks to eighteen days after service, and then, if she refuses the horse, she should be tried every week for some four weeks; and if she fails to come in within that time it will be rea-

sonably certain that she is in foal. She ought to be closely watched, however, for some weeks afterwards, because in some cases mares will pass over a period of one or two months, or even longer, without any appearance of heat, and yet not be pregnant. Again, there are other mares—and they are more numerous than one would suppose—that will appear to be in heat and will freely receive the horse when they are in foal, and even almost up to the time of foaling. Such mares are always very annoying both to their owners and to the keepers of stallions.

For convenience in trying mares it is best to erect the barrier parallel to and about four feet distant from a solid fence or wall, so that the mare will be compelled when behind it to stand with her left side toward the horse; and the barrier should be so substantially built that it can not be kicked or pushed down. In many cases the only barrier used is a strong pole fixed about three and a half feet from the ground; but it is much safer and better to build up the space to that height, close and solid, with strong material of some kind, so as to lessen the danger from kicking and striking. This may be conveniently done by setting three posts firmly in the ground, about four feet apart, and nailing strong oak or other hard-wood boards to these posts, on both sides, from the ground up to the required height, and then capping them over with a board of the same material. When trying the mare keep the horse well in hand, by the use of the bit, previously described, if necessary, and do not let him get his nose further back than to the mare's flank. If the stallion is a valuable one, and is expected to do much service, it will be best to have another horse of but little value for a teaser, but when the service required is but light it will work no injury to the horse to let him do his own teasing. Occasionally a horse will be found to have a

peculiar aversion to a certain mare to such an extent that he will refuse to serve her. In such a case it is well to bring into the same inclosure another mare that is in heat, and when his amorous desire is aroused by her presence he can usually be made to serve the one that he had formerly refused.

THE NUMBER OF MARES TO BE SERVED.

The number of mares that a stallion may safely be permitted to serve during a season has long been a subject of discussion among horse-breeders. It is generally held that the two-year-old stallion will be all the better for not serving any mares at all, that a three-year-old should be limited to fifteen or twenty services, and that a four-year-old should not go beyond twenty or thirty. There can be no question that the use of the procreative powers by the unmatured horse tends to retard his physical development, and as a general rule it may be stated that there is no horse but would be the better for absolute continence until he is fully matured.

But while this is unquestionably based upon sound physiological law, and is the true theory of perfect physical development in the male, there are advantages attending the earlier use of the stallion to a moderate extent that perhaps more than compensate for all the damage that may result from it. It is very desirable, at the earliest possible stage in the life of a stallion, to ascertain what his qualities as a foal-getter are likely to be, and with this object mainly in view I consider it wise to let the two-year-old serve a few choice mares, merely enough to show the character of his get. I should, with the same object in view, permit him, as a three-year-old, to serve a rather larger number, which may thereafter be increased with each succeeding year until he

is fully matured, when, if properly taken care of with reference to food and exercise, one hundred mares may be safely served during the season. With the young stallion that is to serve but a few mares I should prefer that these should all be served within the space of a few weeks—say two or three a week until his limit for the season has been reached —and then let him be withdrawn entirely from the breeding stud. He will soon forget all about it—will cease to fret after mares, and will have nothing to do but to *grow* until the next season. But when it comes to doing *business* with the stallion he should rarely be permitted to serve more than twice a day; and even this should not be kept up for any great length of time. One a day during the season is better; but the groom can not always do as his judgment dictates in this matter. If the horse has had a period of comparative abstinence he may, if convenience demands it, serve three times in one day for a few days in succession; but this should not be kept up long, and a season of comparative rest for recuperation should follow this extraordinary demand. In the great breeding studs of Germany, under government direction, it was long held that from fifteen to twenty mares was enough for a stallion during the season; but the number has gradually been increased without perceptible detriment, until now the number frequently exceeds one hundred.

The number of mares that a horse serves during a season appears to have but little effect upon the percentage of foals begotten. We have no statistics bearing upon this subject in this country, but such as we have from the books of private keepers of stallions abundantly prove this position. The condition of the stallion appears to be the controlling consideration, and so long as he is strong and vigorous his powers of reproduction continue. There may come a time,

however, when from overtaxing this power, partial or entire loss of virility may ensue. The books of stallion service of Rysdyk's Hambletonian show the following remarkable result:

Years.	*Age.*	*Mares covered.*	*Per cent of foals.*	*Foals dropped.*
1851	2 years	4		
1852	3 years	17	76	13
1853	4 years	101	78	78
1854	5 years	88	70	62
1855	6 years	89	72	64
1856	7 years	87	73	64
1857	8 years	87	72	63
1858	9 years	72	75	54
1859	10 years	95	70	66
1860	11 years	106	68	72
1861	12 years	98	69	68
1862	13 years	158	70	111
1863	14 years	150	61	92
1864	15 years	217	67	148
1865	16 years	193	67	128
1866	17 years	105	71	75
1867	18 years	72	58	42
1868	19 years	None.		
1869	20 years	22	81	18
1870	21 years	22	72	16
1871	22 years	30	80	26
1872	23 years	30	80	24
1873	24 years	31	65	20
1874	25 years	32	75	24
1875	26 years	24	8	2

This table makes the remarkable showing of 1,331 foals begotten by a single horse out of 1,930 mares served—an average of 69 per cent of foals to mares served. His average of mares served from the time he was three years old up to the year of his death (not including 1868, when he did nothing) was about 83 mares per year.

The statistics of horse-breeding in Saxony, from 1856 to 1862, inclusive (seven years), also confirm the position above advanced. The returns for 1856 show that the stallions that served 90 to 100 mares each produced a greater percentage of live foals than those that served any other number, except those that served from 30 to 40. In 1857 those that served over 110 mares each produced 25 per cent more foals than those that served a less number. In 1858 those that

served 60 to 70 mares got a larger percentage of foals than any other, except one that served less than 10. In 1859 the highest percentage belonged to those that served 50 to 60 mares. In 1860 the highest belonged to those that served over 90 mares; while those bred to 10 or less stood lowest. In 1861 those that served 80 to 90 mares lead, while those below 20 show the smallest percentage of foals. In 1862 60 to 70 were the most productive, while those below 10 were the lowest in the percentage of foals produced. From this data, as well as those derived from the statistics of horse-breeding in France and the general results attained in this country, so far as we can approximate them, it is safe to conclude that the number of mares served has no influence on the percentage of foals got, and that a horse properly treated may serve from 80 to 110 mares in a season with as large an average percentage of foals as one limited to less than half that number.

EFFECT OF AGE UPON THE FERTILITY OF A STALLION.

Another point upon which there has been much discussion is the effect which age has upon the fertility of a stallion; and here again we are left without any official statistics of horse-breeding in our own country, and will resort to those of Saxony. For the years above quoted, 1856 to 1862, inclusive, we find the returns disclosing the following state of facts: In 1856 the average get of the stallions, aged six, nineteen, twelve, eighteen and fourteen respectively, and in the order named, was the highest, while those aged eight, nine, seventeen, sixteen, five and seven were the lowest. In 1857 those aged four, twenty, fourteen, seven and eight got the largest percentage, in the order named, while those aged five, nine, eighteen, seventeen and six were the lowest; and those aged twenty-one and twenty-two got more foals than

those aged five, six, nine, ten, seventeen and eighteen. In 1858 the highest average was produced by stallions aged nine, ten, five, six, eight, fourteen, seventeen, twenty and twenty-two years, and the lowest by those aged eighteen, nineteen, four, three, thirteen and seven. In 1859 the percentage was nearly uniform for all ages. In 1860 those aged seventeen, eighteen and nineteen led the columns, while those aged four, twelve and nine were last. In 1861 the percentage was quite uniform. In 1860 a stallion aged twenty begot twice as large a percentage as one aged four; one aged ten stood the highest, while sixteen, six and four stood at the bottom of the list. The table above given of the get of Rysdyk's Hambletonian also shows that in his case age apparently had nothing to do with his fertilty. Hence we conclude that, as in the number of mares served, so in the matter of age, the reproductive powers of the stallion appear to be almost entirely a matter of condition, and that age has no effect whatever upon the percentage of foals.

EFFECT OF AGE UPON THE QUALITY OF THE GET OF THE STALLION.

There has also been much speculation as to the comparative value of the foals got by a given stallion at different periods of life. The statistics of European horse-breeding throw but little light upon this subject, but our own turf and trotting statistics furnish us with abundant evidence to prove that here also the age of the sire has no effect.

To illustrate this point I give the following list of celebrated running and trotting horses, among the most distinguished, either as sires or performers, that have ever been produced in America, with the age of sire and dam. The age of sire is given at the time of copulation, and that of the dam at birth of foal. The list is taken at random from names that suggested themselves to me on account of

their reputation either as sires or performers, and without reference to what the figures might show:

Name of horse.	*Age sire.*	*Age dam.*	*Name of horse.*	*Age sire.*	*Age dam.*
Sir Archy	27	9	Oltipa	18	10
American Eclipse	9	12	Spendthrift	17	15
Lexington	16	14	Duke of Magenta	24	8
Boston	18	19	Parole	18	11
Fashion	7	10	Harry Bassett	17	8
Duroc	28	6	Longfellow	13	12
Wagner	17	7	Preakness	16	14
Grey Eagle	6	11 or 12	McWhirter	6	9
Tom Bowling	19	13	Bramble	21	8
Ten Broeck	6	10	Fellowcraft	11	9
Aristides	18	5	Sensation	23	9
Foxhall	5	7	Iroquois	24	11
Rarus	13	10	Lucille Golddust	10	..
St. Julien	14	8	Huntress	9	12
Goldsmith Maid	4	8 or 9	Voltaire	4	12
Alexander's Abdallah	2	..	Prospero	3	7
Volunteer	4	4	Dame Trot	4	8
Dexter	8	10	Elaine	8	12
Lady Thorne	11	..	Walkill Chief	15	7
Lucy	6	..	Orange Girl	21	13
Nutwood	5	5	Indianapolis	4	12
Maud S.	9	9	Woodford Mambrino	18	8
Hannis	10	..	Wedgewood	5	16
Mambrino Gift	6	7	Rysdyk's Hambletonian	23	..
Scotland	15	10	Mambrino Chief	18	..
Trinket	4	10	Darby	10	6
Lula	14	9	Piedmont	6	11
Clingstone	9	6	Edwin Thorne	7	11
Daniel Lambert	9	11	Geo. Wilkes	6	8
Jay-eye-see	14	10	Dictator	13	14

Of the foregoing, Prospero, Dame Trot and Elaine have the same sire and dam; Nutwood and Maud S. are half-brother and sister; Mambrino Gift and Scotland are both out of Waterwitch—the former by a six-year-old trotting sire and the latter by a fifteen-year-old thoroughbred. Woodbine at eight years old produced Woodford Mambrino by a horse of eighteen, and when herself sixteen she produced Wedgewood by a five-year-old stallion. Hambletonian got Dexter, his best son, at eight years old; Nettie, his next fastest by the record, when he was sixteen, and Orange Girl, who comes next, when he was twenty-one. Volunteer got St. Julien (2:11¼) at twelve years, Gloster (2:17) at nine, and Huntress (2:20¾) at seven.

PERCENTAGE OF FOALS TO MARES SERVED.

Still another question of great interest to horse-breeders is this: What is the actual average percentage of live foals that a given stallion will get under average circumstances? In other words: What percentage of foals must a stallion get to entitle him to be classed as a reasonably sure foal-getter? And upon this there is often much loose assertion without any real array of facts to back it up. It is to the interest of stallion-keepers to make the largest possible showing in this respect; hence they often talk at random, and not infrequently misstate facts. Perhaps in most cases actual falsehoods are not stated; but the parties do not care to *know* the exact truth lest they may be compelled by self-interest to state an untruth. Hence they find it convenient never to make an exact estimate, and content themselves by saying: "Oh, he got nearly everything with foal." Now, from a very extensive correspondence with reliable breeders who keep accurate accounts of results, as well as from my own observation, based upon an experience of thirty years with many different horses, I am decidedly of opinion that the average indicated in the table of the get of Rysdyk's Hambletonian is considerably above the general average of stallions in this country.

But this question is removed beyond the realms of conjecture by the recorded results in the government breeding studs of Germany. I give herewith a table which was compiled by myself a few years ago from the statistics of horse-breeding in the government studs of Germany, as given by the late Hon. J. H. Klippart in his report to the Ohio State Board of Agriculture. These statistics run back to 1859, and include all the intervening years up to 1874, except 1869, in which are shown the results at eleven different points. The first column under each locality named shows

the number of stallions employed for that year; the second gives the average number of mares served by each horse, expressed in whole numbers and decimals; the third gives the percentage of mares served that proved in foal, and the fourth gives the percentage of mares served that produced live foals. The table is full of interest, and may be studied by horse-breeders with profit. It will be observed that the percentage of mares that proved in foal, as well as the percentage of live foals dropped, varies considerably in the different establishments. The highest percentage of mares in foal was at the great Trakehnen establishment, in 1860, when the average was 80.2; and here we also find the highest average throughout the entire series of years. But we find the average running as low as 40 per cent in 1874, at Wickrath, with only 33.3 per cent of live foals, while several localities report as high as 62.6 of live foals. It would be interesting to know the causes which produced the great differences in these averages, and why it is that the stallions in the Trakehnen establishment were so much surer, or else a smaller percentage of the mares barren, than at at Wickrath and some others? But the average result obtained from this great number of stallions and mares for so long a period may safely be accepted as establishing a general law or rule that can be depended upon under like circumstances. (The tables above referred to will be found on the two following pages.)

Taking the entire career of all the establishments reported from 1859 down to 1874, with an average of over 1,000 stallions and 42,000 mares per year, as above stated, we find the results as follows:

Average percentage of mares in foal	67.7
Average percentage of live foals dropped	53.3
Average percentage of mares aborted or miscarried	4.8
Average percentage of mares dying or not accounted for	9.6

TABLE, SHOWING THE PERCENTAGE OF MARES GOT IN FOAL, OF LIVE FOALS DROPPED, AND OF MARES THAT ABORTED OR MISCARRIED, IN ABOUT 1,000 STALLIONS AND ABOUT 42,000 MARES, PER ANNUM, FOR FIFTEEN YEARS.

Year.	Trakehnen, *Insterburg.*			Marienwerder, *Prussia.*			Lindenau, *Mark Brandenburg.*			Zerka, *Province of Posen.*			Lebus, *Silesia.*		
	No. of stallions.	Av. No. of mares to each stallion.	Av. percentage in foal.	No. of stallions.	Av. No. of mares to each stallion.	Av. percentage in foal.	No. of stallions.	Av. No. of mares to each stallion.	Av. percentage in foal.	No. of stallions.	Av. No. of mares to each stallion.	Av. percentage in foal.	No. of stallions.	Av. No. of mares to each stallion.	Av. percentage in foal.
1859	307	41.4	71.5	99	38.8	67.2	137	38.5	62.2	198	33.2	71.2	149	48.1	59.2
1860	314	49.6	80.2	99	41.9	67.8	131	42.9	64.5	128	37.8	70.2	141	53.9	59
1861	316	55.8	77.2	99	47.3	68	136	42.1	64.1	135	42	70.3	143	54	58.2
1862	314	55.6	77.1	100	46.6	69.1	133	26.2	65.5	142	45.1	72.8	139	63.8	60.7
1863	324	57.5	75.4	105	48.6	69.3	134	46.4	66.3	143	45.3	71.8	150	60.4	57.8
1864	328	52.2	74	105	45.1	68	135	42.6	66	140	42.6	73	150	52.5	60
1865	319	44.8	75	105	43.4	69	136	38.7	68	144	41.3	73	152	52.9	58
1866	302	43.8	74	105	37.8	71	140	33.9	68	145	40.7	73	152	44.6	58
1867	297	47.1	74	105	36.4	66	159	32.4	67	144	36.1	64	156	42.9	58
1868	295	....	69.5	103	37.4	66	157	33.4	68	143	70.7	65.9	157	47.9	61
1870	293	....	80	105	43.8	67	152	36.2	71	163	43.9	71	163	48.9	65
1871	292	....	73.4	105	42.6	67	144	37.9	70	174	40.1	66	154	51.6	65
1872	302	....	80	105	49.5	63	146	49.9	65	180	47	63	160	63.2	66
1873	313	....	80	109	52	64	145	59	65	201	53	64	167	70	62
1874	327	52.3	80	116	51	66	153	49	65	225	39	66.8	176	52	64

Year.	Trakehnen, *Insterburg.*		Marienwerder, *Prussia.*	Lindenau, *Mark Brandenburg.*	Zerka, *Province of Posen.*	Lebus, *Silesia.*
	Av. percentage of live foals.		Av. percentage of live foals.	Av. percentage of live foals.	Av. percentage of live foals.	Av. percentage of live foals.
1859	55.5		52.4	51.6	55.1	46.3
1860	56.8		58.4	47.1	59.8	48.9
1861	54.6		55.8	49.6	58.3	47.6
1862	56.4		55.8	50.2	60.5	49.4
1863	62.6		58.8	50.4	60.2	48.3
1864	59.5		58.3	50.9	62.6	49.1
1865	56.5		57.1	50.9	60.5	49.7
1866	55		54.7	50.7	62.6	44.6
1867	50		52.4	50.9	52.3	42.9
1868	....		52.7	51.8	55.2	48.7
1870	....		50.9	51.1	51.9	49.2
1871	....		53.8	53.3	51.6	49.6
1872	....		50.7	50.9	50.8	54.8
1873	....		51.5	50.8	50.9	55.6
1874	60		54.9	153	49	65	225	39	66.8	176	52	64	52.8	53.8

TABLE SHOWING THE PERCENTAGE OF MARES GOT IN FOAL, OF LIVE FOALS DROPPED, AND OF MARES THAT ABORTED OR MISCARRIED, IN ABOUT 1,000 STALLIONS AND ABOUT 42,000 MARES, PER ANNUM, FOR FIFTEEN YEARS.—*Continued.*

Year.	Repitz & Dohlen, *Saxony.*				Warendorf, *Westphalia.*				Wickrath, *Rhine Provinces.*				Polen, *Schleswig-Hols'n*				Celle, *Hanover.*				Dillenberg, *Hesse Nassau.*			
	No. of stallions.	*Av. No. of mares to each stallion.*	*Av. percentage in foal.*	*Av. percentage of live foals.*	*No. of stallions.*	*Av. No. of mares to each stallion.*	*Av. percentage in foal.*	*Av. percentage of live foals.*	*No. of stallions.*	*Av. No. of mares to each stallion.*	*Av. percentage in foal.*	*Av. percentage of live foals.*	*No. of stallions.*	*Av. No. of mares to each stallion.*	*Av. percentage in foal.*	*Av. percentage of live foals.*	*No. of stallions.*	*Av. No. of mares to each stallion.*	*Av. percentage in foal.*	*Av. percentage of live foals.*	*No. of stallions.*	*Av. No. of mares to each stallion.*	*Av. percentage in foal.*	*Av. percentage of live foals.*
1859	115	37.1	58.4	43.9	75	31.1	59.2	45.3	50	35.4	57.6	49.6	....	....	....	....	....	....	....	....	....	....	....	....
1860	107	38.5	57.3	47.5	79	33.9	59.4	46.6	50	43.1	56.9	50.1	....	....	....	....	....	....	....	....	....	....	....	....
1861	105	42.4	61.5	50.2	79	34.6	60.7	46.7	50	37.9	58.7	52.2	....	....	....	....	....	....	....	....	....	....	....	....
1862	100	44	64.2	51.1	80	34.6	59	46.2	51	36.5	59.9	52.3	....	....	....	....	....	....	....	....	....	....	....	....
1863	105	41.9	65.5	52.9	81	34.8	60.8	47.1	55	34.9	59.6	53	....	....	....	....	....	....	....	....	....	....	....	....
1864	100	42.6	66	52.1	77	36.6	63	51.6	55	28	60	54	....	....	....	....	....	....	....	....	....	....	....	....
1865	99	40.1	66	51.3	74	25.1	64	47.8	51	23.2	60	52.1	....	....	....	....	....	....	....	....	....	....	....	....
1866	97	37.6	66	51	76	24.8	59	43.9	48	21.9	58	48	15	26.6	61	46.2	216	43.6	65	55.5	82	45.6	43	39.9
1867	80	33.5	63	48.9	68	27.7	59	48.3	66	26	52	42.9	17	20.9	62	55.5	203	35.7	62	52.6	80	45.1	42	38.3
1868	84	34.9	64	49.3	68	29	60	46.7	66	36.9	53	43.8	24	27.2	61	53.3	190	37.9	63	53.8	84	36.9	48	45.2
1870	82	36.2	65	49.1	68	28.5	63	47.8	52	18.4	57	39.1	31	45.2	63	50.4	184	39.7	68	58.9	102	28.5	42	38.6
1871	72	38.4	64	50.2	64	29.7	65	51.5	47	15.7	53	45.2	35	46.8	65	56.2	172	49.3	65	56.5	91	33.4	50	40.3
1872	72	48.3	62	45.1	67	41.5	62	48.5	43	30.9	56	44	43	56	62	51.2	179	57.8	66	60	95	48.2	48	46.2
1873	79	53	59	50.9	73	54	64	50	41	48	50	39	51	73	59	49.3	191	68	66	58.8	108	54	50	46.3
1874	83	49	59	42.8	81	47	58	46.8	47	36	40	33.3	64	62	62	51.6	217	59	68	59.3	108	52	53	50

If the foregoing may be accepted as the general rule, we may state that the average stallion will make as much money for his owner by standing at $10 the season, as he will at $14.75 to insurs a mare with foal, or $18.75 to insure a living foal; and that a horse that can show 53 living foals to 100 mares served, is an average foal-getter. Whether these figures will apply exactly to horse-breeding as managed in this country or not is of course not definitely known; but they are so nearly in accord with the results of my own experience and observation that I have no hesitation in accepting them as substantially correct.

MANAGEMENT OF THE STALLION AFTER THE SEASON CLOSES.

The condition of the stallion for the next season's business will depend largely upon the manner in which he is kept from the close of the present one until the next season commences. In most cases the period from the 1st of October to the 1st of March is one in which the stallion is not called upon to do duty in the stud, and usually but little is done after July 1. It is a period of rest, of recuperation from the drain upon the functions of the sexual organs which service in the stud has required; but it should not be a season of pampered and overfed indolence, as is too often the case. When it is convenient to do so, the very best possible treatment that can be resorted to during this period is to use the stallion at light work. If a draft horse that has been—as they all ought to be—broken to work, let him be driven moderately by the side of a quiet mare or gelding, and worked regularly up to the 1st of February, and fed enough grain to keep him strong and healthy, but not fat. Oats will be much better food for him than corn; but if it is found that he is becoming too thin, or if the work is comparatively heavy, corn may be used part of the

time with good results. If the stallion is a trotter or a roadster by all means drive him on the road. If you can use him regularly as a business horse so much the better; and, as in the case of the draft stallion, feed him enough to keep him strong and hearty, and work him right along, as though you intended that he should earn his living. This I am satisfied from experience is the best treatment for stallions of any breed, and will result not only in bringing the horses to the beginning of the next season in better condition than any other, but the probabilities are that a horse so treated will get more and better foals than one that is not worked during this period.

But in very many cases, and especially in large breeding establishments, and with thoroughbred stallions, the course recommended above is practically out of the question. The next best thing, then, if the horse must perforce remain in comparative idleness during the period mentioned, is to provide him with a large paddock—the larger the better always—and let him have the run of it at all times during pleasant weather, stabling him only at nights and during storms; and, when kept under these conditions, it will be best to dispense almost entirely with grain food of all kinds. A run to grass during the late fall, if it can possibly be provided, will be one of the very best things that can be had; but this will rarely be the case. The main reliance in most cases must be good hay; but I very greatly prefer corn-fodder when it can be had, as it furnishes a complete change of diet from what the horse has been accustomed to—a change that will prove highly beneficial to the general health of the horse. It reconstructs him, as it were, and makes a new horse of him, after a few months of such treatment, and is certainly the next best thing to the run at grass, before recommended. But while he is

kept on this food due attention must be paid to his bowels lest he should become constipated—a condition that can usually be prevented or remedied, should it occur, by the use of an occasional bran mash.

The necessity for this change in diet from grain to coarse and bulky food, like hay or corn-fodder, is increased in proportion to the degree of confinement to which the horse must be subjected. There is nothing that will so soon destroy the health and vigor of the horse, and especially of his genital organs, as close confinement and high feeding; and the man who expects to keep his horse in show-condition the year round will find that he has undertaken a difficult job. It will work in some cases for a year or two; but, like constant indulgence in intoxicating liquors in man, it will, in the end, sap the strongest constitution. A strong, vigorous horse may be able to withstand the deleterious influence for a few years, but it is only a question of time with the best.

EFFECT OF CASTRATION ON STALLIONS.

It may be proper to supplement what I have written upon the management of the stallion by a few remarks concerning the effect of castration and the time at which it should be performed. It frequently happens that it is found desirable to castrate a stallion after he has performed several seasons of service in the breeding stud, but many owners are deterred from doing so from mistaken notions as to the dangers of the operation and its probable effect upon the temperament of the horse. So far as the danger is concerned it is very slight with any horse in good health and not enfeebled by age, if performed in pleasant weather and by one competent to do the work properly; and the idea that castrating a stallion after he has arrived at ma-

ture years will make him dull, sluggish and lazy, is altogether erroneous. Such displays of animation as are excited purely by his sexual desires will of course be wanting, but aside from these little change in his temperament will be noticed. Any horse that is kept closely stabled and given but little exercise, as is the case with most stallions, will, when brought out, show a playful disposition; but when put at regular work much of this will disappear. Very few horses are gelded on the European continent, and yet the stallions that are used for work are found to be as tractable and quiet as geldings would be under similar circumstances.

Stallions are usually greatly superior to mares and geldings in courage. It is a rare thing to find a stallion that is "skittish," or easily scared. In this particular castration produces a great change in most horses. The horse that, as a stallion, was not afraid of anything, could not be frightened, and was never known to shy or run away from any object, often becomes a timid, flighty creature when gelded. The stallion in a herd of wild horses appears to consider himself the protector of the herd, and, instead of flying at the approach of danger, is rather disposed to stand his ground, and in many cases even to act on the aggressive, and never deigns to fly until the females of his herd are in motion. This same cool indifference to danger appears to attach to the domesticated stallion, and makes him much less liable than a mare or gelding to take fright and shy or run away.

It is the opinion of most experienced breeders that keeping a horse entire has a tendency to develop his shoulders; and it certainly does increase the size of the neck. It also gives a different expression to the head, so that the experienced horseman can usually distinguish between a stallion and gelding, simply by seeing the heads, almost as

readily as a cattle-dealer can tell a steer from a bull by the head and horns. It is also thought by most breeders that this unusual development of the neck and shoulders in the stallion is at the expense of development of the hind quarters.

While it is the usual custom to castrate at two years old, if the colt appears to be timid and skittish a greater degree of courage will be developed by leaving him entire for a longer period. If he is inclined to be vicious the earlier the operation is performed the better; and horses, that as stallions were so vicious as to be positively dangerous, usually become docile and obedient after having been castrated.

FIGHTING BETWEEN STALLIONS.

When several stallions are kept on the same farm or in the same stable great care should be taken to prevent them from breaking loose and doing serious injury to one another by fighting; but in spite of all the usual precautions such accidents are liable to occur. I recently read an account of a combat of this nature where various means of separating the horses were tried in vain, when it was resolved to try the lasso. At the first cast one of the stallions was securely caught, but it was only after three unsuccessful attempts that the other one was secured. With a few men at each rope the infuriated beasts were easily choked down and separated. I have seen several conflicts of this nature, and know by experience something of the difficulty and danger of attempting to separate the combatants; but this is the first instance in which I have heard of the use of the lasso, and it occurs to me that it may frequently be found to be the very best possible means of accomplishing the difficult and dangerous task. The horses must be fearlessly approached, however, to succeed even with the lasso; for,

while the fight is progressing, they are usually on their knees attempting to bite each other on the legs. The noise which attends such a combat is positively terrific, and usually paralyzes the spectators with terror. The horses rush at each other with a roar, and, when about to come in contact, they usually wheel about and receive the shock on the haunches. After a few seconds of contact at this point, when the roaring is usually most terrible, they again wheel about, endeavoring to grasp each other's fore legs with their teeth. To ward off this mode of attack each stallion usually sinks to his knees, and then the battle begins in earnest.

When a jack attacks a stallion he almost invariably makes for the throat of his antagonist; and when once his teeth are closed with a firm grasp there is no means of releasing his hold except to lay the infuriated beast senseless by a blow upon the head; and even then mechanical appliances often have to be used to unlock the clenched jaws. Such a contest as the one last described usually results in the death of the stallion; and when both stallions and jacks are kept in the same stable the greatest care should be taken to avoid the possibility of a combat between them.

THE BROOD MARE.

The influence of the dam in the transmission of hereditary qualities is, in my opinion, usually very much underestimated, and it is frequently ignored entirely by horse-breeders. Instead of writing or speaking of horses, or classing them with reference to the female ancestry, as is the custom with cattle-breeders, the female element in the pedigree of a horse is almost entirely lost sight of, while to the male is given especial prominence. This can not be other than a serious mistake; and the man who keeps a worthless animal in the breeding stud, simply because he can not

sell her, will not be able to compete with his neighbor who reserves the very best mares of his raising for breeding purposes, even though they both patronize the same stallion. The mare certainly exercises as potent an influence upon the progeny as the stallion; and while in exceptional cases a very inferior one may produce a good foal, yet if we examine the records of the trotting turf we shall find that in nine cases out of ten, even when the pedigree of the dam is unknown, she was "a great road mare." Greatness springs from greatness, and every living thing brings forth young after its kind. And especially in the matter of soundness do I insist that the mare which is selected for the breeding stud should be unobjectionable. There is scarcely an ill to which horse-flesh is heir that is not transmissible by inheritance. The precise disease itself may not be inherited, but the constitutional weakness that makes this or that organ peculiarly susceptible to disease is clearly a transmissible quality. No one will pretend to say that flatulent colic is an inherited disease; but we have the very best of evidence that some horses are more subject to this disease than others, and that they transmit this tendency to their offspring. Acute laminitis may not be a constitutional infirmity; but the peculiar formation of joint that falls an easy prey to this disease is as clearly transmissible as are color and form.

CAUSES OF BARRENNESS IN BROOD MARES.

I have spoken at considerable length elsewhere of the dangers to stallions from overfeeding. All that was there said concerning the harmfulness of this practice as applied to stallions might well be repeated here with increased emphasis. It is undoubtedly one of the most frequent causes of barrenness, and the dangers attending parturition

are more than trebled in cases of excessively fat animals. Deaths from parturient fever, or milk fever, are almost unknown in mares that are kept actively at work and are in only moderate flesh at the time of foaling. A case well illustrating this point came under my own notice recently of a farmer who had four mares that dropped foals in one season. The mares were all very fat and had been kept in high show-condition for a year or more. One of the mares died of parturient fever, and he lost three out of the four foals.

I have had occasion heretofore to quote from that most excellent authority, Prof. Law, of Cornell University. A few years ago he prepared, at my request, for publication in a journal which was then under my control, an article on the causes of difficult impregnation and barrenness, and from this article I quote so much as relates to brood mares:

Females that are not put to the male until long after they have reached maturity are often difficult to impregnate for the first time. This is frequently noticed in mares that have spent a good part of a lifetime at hard work; and in these cases it may often happen that the long inactivity of the generative organs has produced an inaptitude for procreation. As a rule the disused generative organs fail to acquire that permanent development which attends on habitual impregnation; and even after a single conception a long period of non-breeding leads to a striking diminution of the womb and passages.

But difficulty is often experienced in securing the impregnation of heifers that have reached full maturity but are neither old nor hard-worked, and the same difficulty is met with in comparatively young and idle mares. In such cases the trouble may often depend on undue sexual excitement, which leads to a spasmodic and rigid closure of the neck of the womb during copulation, or to excessive expulsive contractions of that organ and the vagina, and the rejection of the semen before impregnation has been effected.

Another occasional cause of sterility in such cases is the de-

generation of the fallopian tubes, which have become blocked by the abnormal fatty product, and no longer allow of the descent and impregnation of the ovum.

The obvious preventive of these conditions is to maintain the functional activity of the organs from the time of full maturity onward. It is a fundamental law of organic nature that structures and functions are developed in ratio with their use, so long as this is kept within natural bounds, and the generative system is no exception to this law. The cow or mare that is bred every year is a more certain breeder than the one which is allowed to skip three or four years between successive conceptions. The faulty conditions resulting from this deferred or irregular breeding will be individually considered below.

There is not a Scylla but has its Charybdis. We should keep this in mind in avoiding the danger just mentioned, and not be driven to the opposite extreme of breeding from very young females, whose development and stamina will be impaired by the constant drain upon it for the nourishment of the coming progeny. It is notorious that females who breed too early fail to attain the full size and development of their family. * * * Females should not be put to the male until they are at least verging on maturity. Above all, the system of breeding from very immature animals should not be continued in the same line from generation to generation, as that can only tend to accumulate and intensify the evil. In the exceptional case of a very forward animal, where an early conception is especially desirable, and where the young dam is either not allowed to suckle her offspring, or is allowed to skip the following year without breeding, the course may sometimes be profitable; but, as a rule, breeding from immature animals should be avoided, for the reasons above mentioned.

An excess of rich and stimulating food, and consequent plethora, is a common cause of non-breeding. In some such cases there is an accumulation of fat, as referred to above; but this condition is seen also in rapidly induced plethora, and where no time has been allowed for the development of fatty degeneration. Among others, the following conditions will serve to explain these: With an extra tension of the liquid inside the blood-vessels the tendency is to secretion rather than absorption; the rich and stimulating quality of the circulating blood maintains an

unusual activity in the glands of the womb, and the result of these combined causes is an excessive production of uterine mucus, among which the semen is expelled before impregnation can be effected. The rich blood is, further, a stimulant to the muscular walls of the womb and vagina, and leads to their contraction under slight exciting causes, so that here again we have an efficient cause of the rejection of the semen and its failure to impregnate.

The correction for this state of things is to reduce the richness and stimulating qualities of the blood. Many accomplish this by bleeding the plethoric animal before putting her to the male. This often succeeds, for it promptly reduces the pressure of the blood within the vessels, and, by determining the absorption of liquid from all available sources, dilutes that fluid and renders it less stimulating. There is one objection to this course—that a moderate abstraction of blood from a system full of constitutional vigor acts as a stimulus to a still more rapid formation of blood for the purpose of supplying the waste, and thus the present success may be gained at the expense of a still greater and perhaps dangerous plethora in the near future.

A preferable course is to place the animal on a spare diet for some weeks before she is to be put to the male, and to further deplete the system by the administration of one or two doses of laxative medicine. For the mare, four or five drachms of Barbadoes aloes; but care should be taken that the laxative be given early enough to avoid having it still operating when the animal is put to the male.

In certain animals and breeds there is a responsive activity of the generative organs, independently of plethora or other diseased condition, and in animals of this kind impregnation often fails to take place, because of the ready rejection of the semen. Such excitement is, of course, greatest during the most active stage of *heat*, and lessens as the period approaches its end. Animals of this kind may often be got to breed if put to the male when the *heat* is passing off, and when they will only just receive him, though it would have proved a failure had they been served while at the height of the sexual passion.

Closure of the mouth of the womb may often happen from the unnatural excitability just referred to, the muscle which closes the neck of the womb being so rigidly contracted that it

is impossible for the semen to enter. This may be easily corrected in the large animals, by steady pressure with the fingers and thumb, drawn into the form of a cone, until the tension gives way and the hand passes freely into the womb. Just before putting to the male, let the oiled hand be introduced into the vagina until it reaches the round, projecting, puckered prominence—the neck of the womb—at the farther end of the canal. In the center of this projection will be felt the depression leading into the opening. Into this it may be only possible at first to introduce one finger; this is to be followed by two, three, and finally by the four fingers and thumb, brought together into a point so as to form a cone. When the passage has been sufficently dilated the animal should be at once served by the male, as delay may allow the relaxed muscle to recover its tone and close the opening as at first. The same end may be attained by introducing an instrument, with smooth, rounded blades, fashioned after the manner of a glove-stretcher, and gradually dilating the passage. It is an easy process in the mare, on account of the shortness and dilatability of the mouth of the womb.

Acute disease of the ovaries may prevent conception in two different ways: 1st. It may prevent the development of the ovum or germ of the future animal; and, 2d, it may cause such sympathetic excitement and contractions in the womb that the ovum can not be fertilized and retained.

1st. *The failure to develop ova* is met with when the whole of both ovaries are involved in certain diseases. When, for example, these organs have undergone complete fatty degeneration, or when they are the seat of extensive cysts, tuberculous deposits or cancer. The fatty change is extremely common in the improved breeds of cattle, sheep and swine. The tuberculous and cancerous taints run in certain families, and are to be mainly obviated by rejecting from breeding such as are strongly predisposed. To prevent *fatty degeneration* we should avoid excess of all foods that are especially rich in oil, or that tend greatly to the production of fat. Among these may be named Indian corn, linseed cake, sorghum and beet. The females should further have a full allowance of exercise to keep the lungs in full activity and favor the oxidation of the fat-producing elements of the food. Absolute rest in hot, close buildings is to be especially avoided.

2d. *Sympathetic Excitement of the Womb.*—When one ovary, or only a portion of an ovary, is affected, the ovum may still be produced; but such is the sympathetic excitement of the womb that the fertilizing semen or the impregnated ovum is invariably rejected. Cases of this kind usually come in *heat* at irregular intervals, and, in some instances, sexual excitement is almost continuous, so that the subject will neither breed nor fatten. They can usually be recognized by their history and by the examination of the ovaries by the hand introduced through the straight gut (*rectum*). Unless in the case of slight congestions, or other removable disorder, such ovarian disease can only be treated by the removal of the diseased ovary, and, if both are affected, the animal is necessarily rendered barren. The operation does not differ from ordinary *spaying* of a healthy animal.

The tortuous tubes through which the ovum passes from the ovary to the womb are frequently the seat of fatty degeneration, so that they become at once blocked by the morbid product and incapable of their normal contractions, and the ovum fails to reach the matrix. When remediable at all, which is only in the earlier stages and slighter forms of the change, this is to be met by the measures advised for fatty degeneration of the ovaries.

Nearly all active diseases of the womb unfit it for retaining the product of conception. Tumors, inflammations and catarrhs, or mucopurulent discharges, usually lead to the destruction or expulsion of the semen or the product of conception, so that in all alike the restoration of a healthy condition of the womb is a prerequisite to breeding. We can not enter further into this subject at present than to say that, in simple catarrhal inflammation, benefit may be derived from a daily injection of one-half drachm of sulphate of zinc, one-half drachm of carbolic acid, one ounce of glycerine and one quart of water—to be used tepid.

Certain kinds of food prevent conception, or, what is equivalent, lead to an early abortion. Among these may be named ergoted grasses, smutty wheat and corn, musty grain, and aliments which produce scouring, indigestions, colics and diseases of the urinary organs. In the same category may be included the free drinking of iced waters when thirsty.

It has been frequently noticed that the persistent breeding of near relations has resulted in a sexual incompatibility, which rendered a male and female of the same family incapable of

breeding together, though each was perfectly fertile with strangers. When we must breed close this should be guarded against by having two or more branches of the same family kept in a different locality and climate, the influence of which may thus be obtained without changing the blood.

THE PRODUCTIVE PERIOD IN BROOD MARES.

The most fertile period in the mare's life is usually at from five to fifteen years of age. They may in exceptional cases be put to breeding as early as at two years old, but I do not recommend such a course, as it seriously interferes with a symmetrical development. If from any cause a two-year-old filly has been served by the stallion and become pregnant it will be every way better to let her pass over her third year without breeding, so that she will not produce her second foal until she is five years old; but a well-developed three-year-old may be safely put to the horse, and she may then be kept at breeding without intermission so long as she remains fertile. At about twelve years the reproductive powers of some mares will begin to wane, but a large proportion of them are quite as reliable breeders up to about fifteen years of age as at any earlier period, especially if they have been kept at breeding from their maturity. Above this age they usually become more uncertain; and regular breeders well up in "the teens" are comparatively rare. There have been, however, well-authenticated instances of mares up to twenty-six years of age producing healthy, living foals. Old Fanny Cook, the dam of the noted trotting stallions Daniel Lambert and Woodward's Ethan Allen, produced fifteen foals, and dropped twins (one of which is still living) when she was twenty-two years old. The great English race mare Pocahontas lived to be thirty-three years of age and produced fifteen foals; her last, Auracaria, being dropped when she was twenty-five years

old, and, contrary to what might have been expected, this daughter of old age herself became a great brood mare, producing, among others, the grand race horses Chamant and Rayon d'Or. Many other very remarkable cases have been reported to me—one by Mr. G. W. Henry, of Burlington, Ia., of a mare, still living at the date of his letter (July, 1882), which then, at twenty-six years of age, had produced nineteen foals, and was supposed to be again in foal.* Several other cases have come under my observation where mares have produced from fourteen to eighteen foals. But these are exceptional cases, and no breeder can safely base his calculations upon them.

I think most experienced breeders will agree that a sufficient amount of exercise and work or training to thoroughly develop the physical powers of both sire and dam is desirable; and, having this point in view, I would not recommend that a filly be relegated to the breeding stud until she has been trained and raced for a year or two, if race horses are desired. With ordinary road horses and farm horses the young mares may be used sufficiently to effect the same object while they are being bred. I am a firm believer in the tendency of animal life to adapt itself to its surroundings and conditions; consequently, I believe in working the sires and dams that are to get and produce work horses, and in trotting or running those that are to produce trotters and runners. It is a law of nature which should not be ignored. The famous old pacing mare Pocahontas produced her best foal (Mr. Bonner's trotting mare Pocahontas, record 2:26¾) about five months after pacing the greatest race of her life. Blink Bonny, the dam of Blair Athol, ran many races in her younger days. The same

*The Breeder's Gazette, Vol. II, p. 71.

is true of Seclusion the dam of Hermit, and of Marigold the dam of Doncaster, and of Little Lady the dam of Camballo, and of Pocahontas the dam of Stockwell, Rataplan, King Tom, etc. But it is needless to specify further; the history of the turf furnishes incontestable evidence of the correctness of the propositions announced at the beginning of this paragraph.

On the other hand, I would expect but little, as a brood mare, from one that had been kept continuously on the turf or at hard, wearing labor, without breeding until past the prime of life. The sexual powers must necessarily become dwarfed, if not entirely lost, from long-continued disuse after having reached maturity; and mares so treated have usually proved barren, although some notable exceptions to this rule may be named. But exceptions are not safe guides for the breeder to follow. It is the general average of results that marks the road to success in any given line of business.

TIME OF FOALING AND PERIOD OF GESTATION.

When the time of foaling approaches the mare should be turned loose in a large and strongly-made box-stall, or if the weather is mild, in a lot or paddock. Everything should be removed from the stall that would be likely to entangle or injure the colt in its struggles to get on its feet. There should be no openings under the manger or elsewhere into which, in its struggles, it might chance to force itself—many dead colts are taken every year from such traps as these. If the weather is warm it is decidedly better to give the mare the run of a good-sized lot, for it is noticeable that when parturition approaches they usually have a decided aversion to confinement. If confined in a stall or small paddock the inclosure should be so secure as to prevent any attempts at breaking out, as these would be liable to

result in injury to the mare, and possibly to the foal. The writer recalls one occasion in his own experience where a favorite mare, that was thought to be near the time of foaling, was brought from her accustomed pasture and placed in the stable for the night on account of a probable storm. The mare was left, as was supposed, securely fastened in her box-stall, but to my surprise the next morning she was found in her accustomed pasture with a foal by her side. Although usually quiet—never before known to jump a fence—she had broken open the door of her stall and jumped two good fences to get back to her accustomed haunts before dropping her foal.

The average periods of gestation in the mare is popularly placed at eleven months, but a careful comparison of statistics gathered from the books of several extensive horse-breeders of my acquaintance, whom I know to be accurate and painstaking in their methods, places the average period at about 340 days. It is a popular belief that male foals are carried longer than females, but the statistics do not bear out this conclusion. The observations of Dr. W. H. Winter, of Princeton, Ill., covering seventy-two cases, make the average period for males about 341 days, and for females 338 days, the longest being 370 and the shortest 317 days. Mr. M. A. Brown, from thirty foals in one year, found the average to be slightly greater for males than females, while on the following year, from thirty-two foals, the females were carried longest. He also reports a perfectly well authenticated case where a two-year-old half-blood Percheron filly was bred to an imported Percheron stallion and produced a strong, healthy horse foal at just 300 days.* Mr. Brown has no doubt as to the accuracy of this state-

* The Breeder's Gazette, Vol. V, p. 556.

ment, the filly having been served but once. This is the shortest period that I have ever known to be well authenticated, although immature foals at shorter periods have been reported. Veterinary writers generally place the extremes at from 300 to 400 days, but the longest period that has been reported to me was by a correspondent at Chatham, O., who states that a mare belonging to him was served May 7, and did not drop her foal until May 17 of the following year, being a period of one year and ten days.*

In view of the indefiniteness of the period of gestation the mare should be closely watched, as there are certain signs of the near approach of parturition which rarely fail. The udder frequently becomes greatly distended sometime before foaling, but the "teats" seldom fill out full and plump to the end more than a day or two before the foal is dropped. Another sign, which rarely precedes the dropping of the foal more than a week or ten days, is a marked shrinking or falling away of the muscular parts on the top of the buttocks back of the hips. In some cases, however, the foal may be dropped without any of these premonitory signs. I remember a case on my father's farm, where a roan mare that had been purchased, and was not supposed to be in foal, was worked hard at the plow up to about the middle of May. She was fed and turned out to pasture one evening, as was the custom, after having been worked hard all day, and nothing unusual was noticed in her appearance. The udder was not perceptibly larger than usual, but next morning we found her with a good strong foal by her side. She was a sorry nurse, however, and the foal lived only a few weeks, dying from "scours," brought on by careless feeding.

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*The Breeder's Gazette, Vol. I, p. 735.

When the mare is a valuable one, and the prospective foal is looked for with a good deal of interest, it is quite well to watch her closely, as many valuable animals have been lost which by a little attention at the right moment might have been saved.

Moderate work is not only harmless but positively beneficial to mares in foal, provided proper care be taken not to overload them. It is certainly better than keeping them tied up in the stable, or permitting them to run at large in the yards or fields with many other horses. In the former case they suffer from want of exercise, and, in the latter, they are exposed to numberless accidents, resulting from racing, playing or fighting with each other. In my own experience in horse-breeding, more abortions have resulted from mares being kicked or otherwise injured by other horses when in the pastures than from all other causes put together. Exercise is essential to good health; and, when moderate work is given—care being taken to avoid overloading, and proper attention being paid to the shoeing, so that there shall be no danger of strains from slipping—the mare will get plenty of exercise without the exposure consequent upon running at large with other horses. If proper care be taken the mare can safely be used in the ordinary work of the farm up to the very hour of foaling; but as this time approaches it is important that the weight be not heavy nor the pace rapid. After the foal is dropped the mare ought to have at least two to three days of rest and quiet, although many farmers who are hurried with their work and can not very well dispense with the services of the mare in the field, find no evil results following from working the mare moderately from the day after the foal is dropped. This practice, however, is not to be commended.

GENERAL SUGGESTIONS AS TO FOOD AND NURSING.

Many mares are at best but poor nurses. Under the head of "Feeding the young foal" will be found some suggestions as to the best food to be used in case the milk of the dam is not sufficient, but the food of the dam may be made to greatly influence her yield of milk. The foods that have been found useful in increasing the flow of milk in the cow will have the same effect upon the milk of the mare. Wheat bran is especially valuable for this purpose if mixed with other and more nutritious foods. It may be made into a sort of slop and fed with ground oats or rye, mixed with cut hay or sheaf oats. Plenty of good fresh grass is one of the very best of aids to healthy and abundant nutrition for both mare and foal. Whatever grain ration is used I would recommend that it be ground and fed wet, mixed with cut straw or hay.

When mares are worked while suckling it is better that the foal should be left in the stable and that the mare be taken to the foal for it to suck at least three times during the day, ample time being given for her to cool out thoroughly before the foal has access to her, otherwise a gorge of the overheated milk may produce serious disturbances in the digestive organs of the foal. Many farmers, however, find little inconvenience from permitting the foals, especially when quite young, to accompany the dams to the field and follow them while at their work. This gives them an opportunity to empty the udder of the mare as often as it may be deemed desirable, and obviates all danger from overgorging that arises when the mare and foal are separated.

FEEDING THE YOUNG FOAL.

It sometimes happens that the milk of the dam is quite insufficient to promote healthy, vigorous growth in the

young foal, and occasionally it becomes necessary to raise a foal entirely independent of the dam. In such cases the best possible adjunct or substitute for the milk of the dam is cow's milk. It should be sweetened at first, as the milk of the mare is sweeter than that of the cow. A little patient effort will soon result in teaching the colt to drink milk readily, but be careful not to give him too much at a time. A half pint is quite sufficient for a colt two or three days old; but the ration should be repeated often—not less than six times a day, the idea being to give the colt really all it will drink, but to feed so often that it will not require very much at a time. As the colt grows older the amount should be increased, and grass, with oats, should be added as soon as the colt is old enough to eat. No ration is better for a colt than cow's milk with these adjuncts. After the colt is two months old skimmed milk should be substituted for the fresh cow's milk. Should there be any trouble from constipation it will be well to add about one pint of oil-meal per day to the ration; in fact, I would recommend the use of oil-meal in all cases, as it furnishes a large proportion of muscle and bone-forming food. If the oil-meal is not obtainable flax-seed may be used. A half-pint of flax-seed boiled with two quarts of bran will make two good feeds for a colt, and this ration may profitably be alternated with the other food. Indeed, it will be well in all cases where, from lack of an abundance of milk of the dam, or from scanty nutrition of any kind, the foal is low in flesh, to early supply the deficiency with a good allowance of cow's milk in addition to what it gets from the dam. The effect of such a ration upon the growth and condition is wonderful, and in all cases where the foal is likely otherwise to enter winter low in flesh I can not too highly recommend its use. A quart of milk morning and evening, in addition to the

grain ration, will be sufficient; and if it be sweetened a little at first the colt will take to it all the more readily, as the milk of the mare is much sweeter than that of the cow.

WEANING THE FOAL.

When the colt is to be taken from the dam it should be tied in an adjoining stall, with the partition so open that they are in plain view of each other, and the food of the mare should be reduced to a very small ration of dry oats and hay. When her udder becomes so full as to cause her uneasiness a part of the milk should be drawn off, but she should not be milked dry. This first milking may be done by the colt itself, but afterwards it should be done by hand, as the milk in the drying-off process soon becomes unfit for the colt; and, besides, the drying off will be more speedily accomplished than when the colt is occasionally permitted to suck. After the milk has entirely dried up the mare and her foal may be separated, and she may safely be turned out to grass.

Skimmed milk may still be given to the colt, especially if it is not in good condition to enter the winter; but clean, sound oats, ground or unground, constitute the best of all grain foods for the colt. I prefer to have them ground; and as cold weather approaches, about one-fourth in weight of corn-meal may profitably be added, as it helps to lay on fat and keeps up the animal heat. A little oil-meal—say a pint a day—may also profitably be given with the oats for some time after weaning. Don't be afraid of feeding too liberally. More colts are injured the first six months after weaning by too scanty a supply of food than from the opposite extreme. As soon as the mare and foal can be separated the foal should have the run of a good pasture, as there is no food better than grass, no medicine so good

as exercise, and no exercise so profitable to young animals as that which may be taken just when they feel like it.

EFFECT OF EXERCISE ON DEVELOPMENT.

I wish to call especial attention to the importance of open air exercise as absolutely essential to a healthy, symmetrical development of bone, muscle and the vital organs. The idea prevails to a very great extent among practical farmers that high feeding and good care will cause an otherwise good colt to grow up into an unsound, "weedy" horse; and, on the other hand, that there is nothing like "roughing it" to develop hardiness and endurance. I am of opinion that the practical results in many cases have been such as to warrant this belief. Not that there is anything bad in generous and liberal feeding, nor good in starvation and exposure; but that with the latter the colt always has pure air and abundant exercise, without which there can be no sound and healthy development. This I regard as a factor in horse-raising second only in importance to that of blood, which is purely an inherited quality, and for lack of which no after-care can ever compensate.

Abundant opportunity for exercise in the fresh, pure air, uncontaminated by stable odors, is an absolute essential to a healthy development in all young animals. It is not sufficient that the colt be *led* out at stated intervals for exercise. He needs the opportunity to romp and play, that he may extend his muscles to their utmost capacity, expand his lungs to their very depths, and send the blood coursing through every vein with fiery vigor. All this is essential to a healthy, robust development of heart and lungs, and bone and muscle; and nowhere can it be obtained in so great a degree of perfection as in the freedom of the open field. A colt that is kept in the stall and fed highly on heating

grains is seldom afforded an opportunity for this health-giving exercise. Like the tender hot-house plant, he grows up deficient in stamina and vigor—a victim to his artificial surroundings, which do violence to every want of his nature. To the exhilarating race in the fields and pastures—which colts as well as boys so heartily enjoy—he is a stranger; and he grows up a stiff, clumsy brute, with only a tithe of the development of lungs and other vital organs that he might have possessed under more favorable circumstances.

This I believe to be all there is of truth in the idea that colts brought up roughly make the hardiest horses; and there is so much in it that it should attract the careful attention of men who have thousands of dollars invested in the business of breeding horses.

But while I plead for this wild freedom in behalf of the growing colt I would not lose sight of the fact that generous feeding and protection from inclement weather are also essential. I condemn *in toto* the starving process as unnecessary and hurtful. A stunted, half-starved animal will never attain to so perfect a physical development as one that has been well fed and cared for. There is a definite period in life allotted to growth, and if during that period only a scanty supply of nutriment is afforded a stunted, dwarfed animal is the inevitable result, which no amount of after-care can remedy. The true policy is to promote the growth of the colt by an abundance of nutritious food, and to secure a healthy and perfect development of heart and lungs, and bone and muscle, by permitting him to romp, and race, and play at will. By following this practice all there is of good in "roughing it" will be attained, and all that is bad or dangerous in generous feeding will be avoided.

"BREAKING" THE FOAL.

Wherever it is practicable the colt should be broken to halter while yet a suckling, and the earlier in life this process is commenced the more easily will it be accomplished. He may soon be led by the side of the dam without difficulty, and when once accustomed to being guided by the halter it will be an easy matter to lead him anywhere. He may also be tied by the side of the dam as the preliminary step in teaching him to stand quietly when hitched alone. The first step in "gentling" a colt is to overcome his natural timidity by gradual approaches, and when he finds that he has no reason to fear the work is half done. All the subsequent lessons given him through all the various steps of breaking and training should be based upon this plan of gradual approaches—a species of sapping and mining that will subdue the most vicious and tame the wildest colt if perseveringly followed. He should be accustomed to the bridle by means of the "bitting rig" before any attempt is made to ride him; and the mounting should always be first attempted in the stall or the lot where the colt is perfectly familiar with all the surroundings. When it is desired to break him to harness the same principle of gentleness and care to avoid giving fright should be practiced. Place portions of the harness on him at a time, and let it remain on him in his stall until he finds that it will not hurt him; then lead him out with the harness on, alone, and again by the side of another horse also in harness. Accustom him perfectly to the use of the lines, and then let him make the acquaintance of the sulky or break-cart. Push it along after him; and when he has found that it also is harmless get him between the "thills," and finally hitch him to it and drive him. It is the most convenient of all vehicles for use in breaking colts for driving, as the weight

is but little, and there is no danger to be apprehended from sudden turning around. Many trainers provide themselves with a stout two-wheeled vehicle, constructed like a sulky, but with very heavy "thills," so strong that the colt can not possibly break them, let what may happen. Such an arrangement is especially desirable for wild or vicious colts that have not been "gentled" when young, or for such as from improper handling have formed bad habits that must be cured.

THE VIEWS OF DR. REYNOLDS, OF LIVERPOOL.

In the introduction to Vol. II of the Shire Horse Stud Book of Great Britain is a paper upon Horse Breeding, which contains so much good, sound, practical instruction, that I cannot do my readers a greater service than by supplementing what I have given on the preceding pages with so much of Dr. Reynolds' work as relates to the brood mare and the young foal, as follows:

Fillies served at two years old, and so coming in to profit as reproductors at three, will rarely develop into very high-class animals, and when it is considered advisable to breed from them thus early they should not be subjected to work, beyond that required to break them in, until their first foals are a couple of months old. The best age to put a mare to the horse is at three years old, so that when she is sold in the autumn of her seventh year the owner will probably have obtained two foals, the value of which, added to the earnings of the mare as a team animal, will leave her full sale price to represent the proprietor's profit. Subject to the influences previously considered, the alliance of strong young mares with aged and robust stallions is the most certain method of obtaining a yearly production of good foals. Mares that have been worked up to ten or twelve years old in towns, and acquired at that age for breeding purposes, seldom fulfill the desires of the purchaser; by the maintenance of high condition for a prolonged period they are rendered prone to sterility and if fecundated they are apt to experience difficulties in labor. When moderately well nourished, comfortably lodged

and unfatigued by excessive and long-continued labor, mares are apt to breed at all seasons of the year, thereby affording the owner an opportunity to secure the dropping of his foals at a period when the exigencies of team labor are not very pressing, and when a fresh and abundant supply of green food can be assured for the mutual benefit of mare and offspring. Mares which are regularly worked, or those having to seek their food in the spring from poor pastures, are much more certainly fecundated than their idle or stable-fed sisters supplied with rich and abundant provender.

The appearances of that physiological condition termed "œstrum," "heat," "in use," etc., are usually manifested in the mare by general signs, and by particular phenomena presented by the generative organs.

The intensity of the objective signs varies very much in different individuals; in some all the symptoms are evinced by inappetence, increased thirst, agitation, impatience, frequent neighing, and efforts to urinate; the vulvæ are swollen — the lining membrane reddened, and a white glairy discharge issues therefrom; in others no signs are recognizable by which the condition of "heat" can be inferred. Its presence is not apparent until the mare is "tried" by a stallion.

The most opportune time for a matron mare to be again served is the ninth day after foaling; for subsequent proof that she has conceived to a former service the twentieth or twenty-first day is usually selected. Many usages are still had recourse to in the endeavor to insure conception by mares that have previously shown an indisposition to be fecundated, but the barbarous customs much practiced in former years by ignorant persons for the attainment of that object are now happily becoming of less frequent occurence.

Acting upon the knowledge that exercise has the effect of provoking the evacuation of the excreta, and also of rendering petulant females more tranquil, the Arabs gallop their mares to excess, and submit them to the stallion fatigued and inclined for rest. The most novel practice in this respect is the administration of about two-thirds of a pint of vinegar to the mare immediately after service. I have no experience of this mode of treatment, and I fail to see any physiological reason why it should be successful. Complaints of the infecundity of a stallion

are ever frequent, and often so when the cause is entirely due to the unfit state in which the mare is presented; unless she is served at the moment in the plenitude of heat her owner should attach no blame to the horse if the essay proves unfruitful. The abstraction of blood has in some cases been followed by successful results; but the most rational practice that can be adopted is to reduce the condition of mares, refractory to conception, by submitting them to a prolonged course of cooling diet, of which corn should form no constituent, and, after completion of the act, to leave them in a state of perfect quietude for several hours.

Sterility in the mare may be due to age or prolonged continence, especially where associated with high condition, or it may arise from abnormal conformation, or diseases of the womb, or the existence of painful wounds, or diseases in the regions of the feet; it is, however, usually induced in mares prone to accumulate fat, by a superabundant supply of highly-stimulating food and the absence of sufficient work.

Medicinal treatment or surgical operations in some rare cases may cure sterility arising from a suspension of the uterine functions or abnormalities of the organ; and the operation of neurotomy has been adopted with success upon mares rendered sterile by acutely painful foot diseases. The treatment for overplethoric mares must be that of reduction to low, or even poor condition.

With the exception that the venereal excitement usually diminishes or disappears, and the animal becomes lazy and quiet, the signs that a mare has been impregnated do not become apparent for some time, nor is the periodical reappearance of "heat" to be regarded as a conclusive evidence of non-conception. It is not impossible for œstrum to co-exist with impregnation. The inconstancy in appearance of the objective symptoms of pregnancy renders that condition but problematical (especially in mares which ordinarily show little appearance of "œstrum") until the sixth or seventh month, when the fœtal movements may usually be discerned in the flank, unless manual exploration of the uterus by vaginal examination is adopted for the purpose of ascertaining whether conception has taken place. Valuable as the operation is for determining the state of the uterus during the primary months of gestation, it should never be employed except in cases of urgent necessity, on account of

the danger and possible death of the fœtus, which may be apprehended to follow its adoption with an irritable mare.

The period of gestation in the mare occupies, as a rule, from 330 to 360 days, during nearly the whole of which time it is of great importance that opportunity is afforded for a sufficiency of daily exercise, especially needful for mares which are not suckling a foal.

When intelligently organized, in regard to the different periods of gestation, ordinary farm work is exceedingly beneficial to both mare and fœtus. Throughout the whole period it is better that the labor should be continued and uniform than violent or irregular. Shafting heavy loads, especially when much backing or turning is required, should not be permitted. Towards the end of pregnancy all work necessitating unequal movements, or even excessive effort, should be discontinued, and with the appearance of the signs that partuition may be expected to take place within a week or ten days, it is advisable, but not essential, that work should be entirely suspended. Pregnant mares should be stabled with due regard to security against annoyance, compression, or injury by other horses, and especially guarded against the accident of being "cast" in their stalls. Medical or surgical treatment should, as far as possible, be avoided; when absolutely necessary, the utmost possible care in its administration is required.

The food and feeding of mares in foal are of great and important interest, the science and practice whereof must be carefully studied by breeders who would be successful in maintaining their mares healthy throughout the period of gestation, and over the act of foaling, and reap the reward of stout and vigorous foals. The quantity and nutritive quality of provender supplied to a pregnant mare should be in strict accord with her individual requirements; the establishment of a just balance between food and the demands for it can be determined by an accurate perception of condition, as exemplified by the possession of vigor and evidences of efficient nutrition.

The two opposite extremes of obesity or plethora and excessive leanness or debility are to be avoided; the former predisposes to abortion and difficult labors, the latter (of the two the least evil) prejudicially influences the nutrition of the fœtus and deteriorates the subsequent secretion of milk. Grass, unaided

by artificial food, is insufficient for the sustenance of breeding mares subjected to labor; to insure the yearly production of strong foals a daily allowance of corn should be continuously supplied to them; but, except in the depth of winter, or for very young or very aged mares, green food, chop and pulped roots suffice for the requirements of non-workers.

Most farmers usually keep their pregnant mares, when not suckling, on the same ration as that supplied to the other working horses. With good keepers the practice suffices to maintain adequate condition, but when the ordinary provender is of low quality the mares should receive an auxiliary allowance.

Mashes or bruised oats or barley associated with pulped roots and chopped hay or straw, moistened with linseed-cake water, are the best adapted foods for working mares in foal—so constituted they afford a substantial, at the same time a non-exciting and easily assimilated diet. Maize is not a suitable article of diet for in-foal mares when it constitutes a chief part of their corn allowance — their newly dropped progeny always exhibit general weakness of muscle and abnormal relaxation of the ligaments of the joints.

For mares pastured during the day a short supply of rack or manger food given in early morning renders their digestive organs less susceptible to the possibly deleterious influences of dew-saturated grass. More than any other farm animals brood mares require to be supplied with diet of the best obtainable quality; every description of food likely to undergo rapid fermentation, or to produce indigestion, must be scrupulously avoided. Long fasts are exceedingly prejudicial, and in cases where they are unavoidable or have been occasioned through neglect, small quantities of tepid water and equally diminished rations of easily digestible food should only be allowed at intervals until the hunger and thirst have been reduced to their normal standards.

Pregnant mares should not be exposed to the influences of very excessive heat nor very severe cold, nor be pastured or folded with store oxen or young horses.

Abortion is produced by any cause operating to disconnect the union of the fœtal membranes with the uterus. These causes are very various and may obtain at all periods of pregnancy. Predisposition to abortion is to be found in peculiar conforma-

tions of the pelvis, enlargements of the iliac bones, diseases of the womb, constitutional irritability, the influences of too stimulative diet or the the reverse, wet seasons, a previous miscarriage, and all circumstances opposed to efficient nutrition and respiration.

The more direct mechanical causes are falls, blows, compressions of the abdomen, violent and spasmodic exertion. Functional disorders, severe illnesses, large draughts of cold water or eating iced grass may be considered as the most frequent physiological causes.

The symptoms of abortion vary with the term of gestation at which it occurs. When it follows shortly after conception the precursory signs, as well as the fact itself, are frequently unnoticed, and the proprietor is led to believe that the mare has not been fecundated; on the other hand, when miscarriage takes place towards the end of the gestative period the premonitory symptoms are almost identical with the signs of normal parturition, but the pains of abortion invariably precede the changes in the appearance of the external organs of generation, which in normal foaling are noticeable some time before the labor pains come on. The usual signs of the fœtus being dead, and not expelled immediately afterwards, are symptoms of ill-health in the mare, accompanied by a puriform and offensive bloody discharge from the vulvæ.

The prevention of abortion is the avoidance of all causes which may have a tendency to produce it. In advanced pregnancy when a symptom of approaching miscarriage has been manifested the greatest care in the subsequent management of the mare is necessary. She should be placed in a roomy, darkened loose box, left perfectly unmolested, and the services of an experienced veterinary surgeon immediately sought. Whenever a mare has "picked her foal" the cause should, if possible, be determined, and means adopted to prevent other pregnant mares being exposed to similar conditions. They should also be removed to a distance from the place, on account of the mysterious sympathetic influence exercised upon the organism of pregnant animals by the mere occurrence of abortion in one of their companions. The attention required by a mare after abortion materially depends upon the indications of her general health. It very frequently happens that the placental mem-

branes are retained in the uterus; these should be removed before decomposition of their component parts is possible, and the mare should not be covered again until every appearance due to the mishap has entirely subsided.

The characteristic signs that the gestative period has been fully and naturally completed, and that parturition may be shortly expected to take place, are very pronounced and so familiar to all persons who have had any experience in the management of brood mares that they need not be enumerated.

The natural instinctive desire for shade and solitude experienced by the mare at this crisis should be indulged by placing her in a warm, roomy and well-littered loose box, so arranged that the progress she makes can be constantly ascertained without causing her annoyance by interruption. Normal parturition in the mare is very rapid; at her full time and with the fœtus naturally placed the act is generally accomplished in a short space of time and without assistance.

The sense of uneasiness created by the presence of the fully-developed fœtus determines contraction of the abdominal muscles and diaphragm, as well as the walls of the womb itself; at the same time the orifice of the latter organ becomes dilated, succeeding efforts of expulsion push the muzzle and fore feet of the fœtus further through the neck of the uterus, in which situation they may be recognized immersed in the fluids of the yet unruptured membranes. More violent pains then force the head and shoulders through the pelvis, and another last contraction expels the posterior parts and completes the act.

If the labor is prolonged and the pains are very strong, a quiet and careful examination should be made, for the purpose of ascertaining whether there is sufficient room for the fœtus to pass through the pelvic arch, and also to determine whether the foal occupies a natural position. In the first case more time may be allowed; in the second the fœtus will be required to be adjusted. To judge accurately of either of these conditions the attendant must be an experienced man, and know the exact time when interference is necessary. Very great harm is occasioned by premature and unnecessary meddling. He should make re-examinations from time to time, and if increased room is but tardily provided, he must take care, by securing the parts presented, that the fœtal position does not become changed from a

natural to a malpresentation through the continued and violent throes of the mare. Dilatation of the passage may be assisted by gentle and well-applied traction upon those portions of the fœtus that are naturally presented. The causes of difficult labor and the means to be adopted to overcome obstructions to delivery, with the treatment of the patient after parturition, are so numerous and belong so intrinsically to the science of veterinary surgery, that they have no place here. Whenever serious obstacles to delivery exist the aid of an experienced veterinary obstetrician should be promptly sought, and no violent tractile efforts employed until his arrival; but if the membranes are ruptured, as they probably will be before it is considered necessary to obtain skilled aid, it is wise to secure with cords the head or legs of the foal when easily practicable. It sometimes happens, especially with old and debilitated mares, that the act of parturition becomes protracted from weakness alone. Such cases not only demand the administration of powerful internal stimulants, but require the employment of well-timed, gentle and firm traction upon the fœtus made to coincide with the throes of the mare; spasmodic, jerking efforts, which do not correspond with the parturient pains, in all cases do much harm, and are of little or no assistance to the act.

After an easy labor strong mares require nothing but attention to their comfort and ordinary wants, and protection from currents of cold air, but if the *accouchement* has been prolonged and painful a stimulant should be immediately given; debilitated mares under the last-named circumstance require frequent alcoholic stimulants, nourishing gruel and good nursing.

The fœtal envelopes, or after-birth, are usually expelled in a short time after natural labor; when retained for a day or two no danger need be apprehended, so long as the mare does not strain and her health continues unimpaired; but surgical interference for their removal becomes necessary when retained sufficiently long to render putrefaction probable.

Aged mares, having very large and pendulous abdomens, derive much comfort from a wide bandage passed several times round the body, adjusted evenly, and with a view of affording support without exerting undue pressure.

After-pains continued for more than an hour are to be regarded as evidence as possibly some important derangement of the womb

and requiring skilled aid. The application of a mustard and linseed poultice over the region of the loins is always consistent treatment in these cases and may be adopted at once to economize valuable time before the arrival of the veterinary surgeon.

When a mare foals in a standing position the fœtus glides down the thighs and reaches the ground unhurt; the umbilical cord is severed and dangerous hemorrhage thereby prevented. When the act is accomplished in a recumbent attitude, and the mare remains down, the cord must be divided between two ligatures previously tied round it a couple of inches apart, but if the mare rises immediately the cord will be ruptured in a safe and satisfactory manner.

Many foals are lost through want of attention at the moment of birth. When the functions of respiration are not promptly established in the new-born foal, efforts must be made to excite them by blowing violently upon the muzzle and into the mouth, and by briskly rubbing the body with a wisp. If breathing is but slowly promoted a few teaspoonfuls of brandy and water, given after the first few respirations, will be of material service to invigorate the low vital powers.

As soon as the mare has recovered from the shock the maternal instinct should be encouraged by allowing her to perform the office of nurse to her progeny, which will be physically benefited thereby. If the dam refuses to dry and caress her offspring, a little flour sprinkled over the back of the latter will sometimes attract her kindly to it; should this means fail the foal must be dried with soft flannel, conducted to the teat, and assisted to obtain its first aliment.

It is sometimes necessary to protect the foal from ill-intention by a peevish dam, but after the mare has permitted the foal to suck, and has evinced maternal solicitude for its welfare by licking and caressing it, no fear need be entertained that she will subsequently injure it wilfully.

All the means briefly reviewed as necessary for the preservation of the newly-born foal and comfort of the mare are to be continued for a period more or less prolonged, as their conditions and surrounding circumstances indicate. If both mare and foal are healthy, and especially if the mare has been pastured up to the time of foaling, they will be benefited by being turned to grass during fine weather, in a week or so after the birth; but

they must be sheltered from rain and cold, particularly at night, so long as the weather continues unfavorable.

At this early period the mare should never be permitted to graze until she has had a small allowance of sweet hay, or some other nutritious dry food, nor should she be subjected to work for at least three weeks after parturition. Some mares, especially primiparous ones, do not furnish sufficient milk for the sustenance of their offspring. In these cases the mammary glands must be frequently stimulated by the foal and subsequently submitted to gentle friction, and a supply of succulent, easily-digestible food allowed. In the absence of a plentiful supply of grass, boiled barley made into a sloppy mash, with the addition of some treacle and a little salt, is a palatable, nourishing diet, tending to increase the lacteal secretion. If these means fail to excite a sufficient flow of milk the foal must be periodically suckled by a foster mare, or be artificially nourished. Should the season not admit of mares being pastured, barley mashes, pulped roots, scalded oats and hay of the best procurable quality, should be liberally supplied. A plentiful allowance of water, or, for bad milking mares, nutritious gruel is necessary.

Most mares, however, secrete a plentiful, and many a superabundant supply of milk. Such do not require, soon after foaling, a more liberal allowance of food than they previously received. The provision of rich but close herbage suffices for their general requirements. In early life, too, foals are prone to contract dangerous diseases of the digestive organs, and on that account it is undesirable that they should be allowed, until several days old, to take the whole milk supply of a free-nourishing or well-fed dam. Under such circumstances the foal should not have access to the mare until part of the contents of the udder have been drawn off. After some days, when the foal has become stronger, the above-named precautions are unnecessary. A more liberal allowance of food may then be supplied, to be regulated by the demands made upon her nutritive functions by the growth of her foal and the wear and tear of labor to which she may be subjected.

In districts where the mare is not required to work until the foal is weaned grass suffices for all her requirements. The best old pastures should, however, be reserved for her use. When these cease to afford sufficient green food by reason of drouth or

overstocking the deficiency must be made up by an allowance of cut artificial grasses, lucerne or clover, given with discretion.

If at any time during the period of lactation the udder becomes inflamed, hot or tense, the diet must be promptly reduced, the milk reservoir very frequently emptied, and warm fomentations adopted, to be followed by very gentle friction with soap and water (greasy substances ought not to be rubbed upon the glands, or if used, the residuum should be carefully removed by subsequent washing). If the foal is dead, or can conveniently be weaned, a dose of physic may be administered to the mare. Under other circumstances it may be necessary to put the mare under medical treatment of less drastic character.

The usual time for weaning is when the foal has arrived at the age of five or six months, when, if the mare has reconceived, or has been or is about to be severely worked, it is for her benefit that the separation should not be longer delayed.

If the milk secretion is not excessive no danger need be apprehended from the process of weaning, which it is desirable in all cases to effect gradually. On the contrary, the separation of the foals from free-nourishing mares must be accomplished by degrees. For some days prior to final removal of the foal the intervals of allowing it to suck must be increased in length, and the food-allowance of the mare reduced in quantity and quality for a corresponding time.

If practicable also the mare should be more severely worked. After ultimate severance of the foal the glands must be periodically hand-drawn, and a brisk purgative administered. Restricted diet, particularly in regard to fluid and succulent provender, should be enjoined until the secretion of milk is completely suspended. Mares kept only for breeding purposes, if in good condition and not enfeebled by age or other circumstances, may continue to nourish their foals for a much longer period—until, in fact, a natural weaning takes place and the milk secretion ceases. The weaning of foals from mares not subjected to labor and furnishing a full lacteal secretion must be accomplished with the exercise of all the hygienic and medicinal precautions previously indicated, and rendered especially necessary by abstinence from work.

Throughout the period of lactation, and very especially during that portion of it when the foal receives the whole of its suste-

nance from the dam, it is requisite for the mare to be supplied with good food calculated to furnish material for the elaboration of wholesome milk.

The first milk after parturition, called "colostrum," differs materially in composition from the subsequent secretion. It contains principles adapted to remove the mecomium (as the effete matters collected in the foal's intestines during fœtal life are technically termed); on that account it is highly necessary that the newly-born foal should be supplied with the milk from its own dam, at least until the mecomium has been expelled and the bowels have assumed their natural function.

Until the approach of the time for weaning, a foal should be permitted to have access to its dam at intervals of not exceeding four hours.

It is frequently alleged that "heated milk" is extremely prejudicial to the foal. I admit there is a probability of troublesome skin disease being caused by allowing a foal to partake of the milk of a mare when she is overheated, but I think the danger of "heated milk" producing diarrhœa or "scour" is exaggerated, or, rather, that the evil consequences in this particular respect are as much attributable to the fact that the young animal, pressed by hunger, partakes too greedily and too plentifully, and, as a consequence, is primarily attacked with acute indigestion.

It is always better to be on the safe side and allow the mare to become cool and to bathe her distended glands with lukewarm water before the foal is admitted to her.

It is not always that a mare which secretes a copious supply of milk is a good nourisher; some, especially old mares, or those subjected to very heavy work and inefficiently fed, elaborate a fluid deficient in nutritive quality, a circumstance rendered evident by the condition of the foal, which will become wasted and probably attacked with diarrhœa.

In such cases the mare must be especially well nourished, and, in instances of extreme necessity, the foal assisted by artificial lactation; it should also as soon as possible be encouraged to take manger food, of which boiled beans should constitute the basis, in order that the advantage of an early weaning may be secured.

Notwithstanding the purgative effects of the colostrum, the young foal frequently suffers from constipation of the bowels,

and especially so if the dam is or has been during the later periods of pregnancy fed with dry or indigestible food; certainly so if the mare has had an acute attack of dyspepsia near the end of the gestative term. Many persons establish the rule that every foal shall have a dose of oil shortly after birth. The practice is generally good—none but beneficial effects are likely to result therefrom, and the life of the foal must be regarded as unsafe until free evacuation of the bowels has been effected. When preceding circumstances have rendered it probable that the foal will be constipated, the exhibition of a full dose of castor oil is imperatively indicated, and, in addition, frequent enemata of warm soap and water are recommended.

It can not be expected, nor is it desirable, that the numerous diseases incident to breeding animals of the equine species and their progeny can be even very briefly reviewed in an essay of this kind; the consideration of such a subject properly appertains to veterinary science. There is, however, one malady affecting young foals which, on account of its frequency and fatality, may be glanced at.

No disease is more prevalent among sucking animals, and few so fatal, as diarrhœa. Although less subject than calves, foals are often carried off by it within a short space of time. The causes have not been accurately determined, but the most eminent veterinarians attribute it to changes of unknown character, and brought about by unascertained causes in the composition of the milk.

Two facts relating thereto have, however, been proved, viz.: that the causes are often widely diffused; and, secondly, that their potency is increased by defective hygienic surroundings, especially unwholesome stable accommodation and overcrowding of animals. Unless curative treatment is very early adopted an unfavorable issue is almost certain, and the generally fatal nature of the disease gives little hope of cure when the symptoms have become fully developed. At the outset a full dose of castor oil ought to be given, the action of which is to be followed by repeated small doses of carbonate of iron and carbonate of soda, with laudanum and brandy, given in cold rice-meal gruel. As food, bean-meal made into the consistency of milk, and given at short intervals, is extremely beneficial, and should take the place of a large proportion of the mare's milk. The diet of the

mare is to be completely changed, and the foal and dam promptly removed to other quarters. As curative treatment is so rarely successful, efforts must be made for preventing the disease. The provision of good, dry, clean lodgings, pure water, and the occasional administration of alkaline carbonates to the mare, the diet of which should be wholesome, and be partly composed of leguminous seeds, are the means most likely to be attended with beneficial results.

Dr. Reynolds' remarks upon brood mares lead me to speak of the effects of pasture upon mares at the time of service. It is the general opinion of those who have given close attention to this subject that mares, when *first turned to grass*, after having been kept stabled, and on dry feed for a considerable period, are not so likely to get in foal as those that have been on grass for some time previous to service by the stallion; or as those that are not on grass at all. The theory is that turning mares to grass produces, for a time, a sort of general muscular relaxation, or softening, that is not favorable to conception. I have always advised that mares which have been kept stabled previous to being sent to the stallion should be kept on dry food for at least four weeks after the service. On the other hand, I have thought it best when mares that had been kept on grass for a considerable previous period, were sent for service, that they should be so kept for some time afterward. At such times I would avoid *any* material change in the food or treatment. If the mare has been kept on grass let her so remain for at least a month; if she has been kept stabled and in idleness let her remain so for a few weeks; if she has been worked continue to work her moderately. Of course these directions apply to such mares only as have not proven hitherto barren. In case a mare has been served repeatedly, and has failed to conceive, a radical change in food and management may bring about the desired result.

CHAPTER IV.

DISEASES PECULIAR TO BREEDING STOCK.

PART I.

The following extracts from articles prepared at my request, by Prof. James Law, of Cornell University, for publication, at various times, under my direction, have a strong bearing upon the subject matter to which this chapter is devoted and will, I am sure, be found highly interesting and valuable to my readers:

HYGIENE OF THE EYE.*

"As ye sow so shall ye reap," is as true of the propagation of animals as of the propagation of grain or weeds. In the case of sightless or partially blind horses it is especially true. In whatever country or district we find blind mares and stallions used for breeding, there we find a large proportion of even the young horses with faulty eyes. In whatever country, on the other hand, we find all horses with impaired eyesight rejected for breeding purposes, there we find the number of blind horses steadily decreasing. This depends not alone on the fact that "like produces like," but upon this additional one, that the greater part of the blindness in horses depends on a specific disease which is as surely hereditary as gout or rheumatism. This is the too familiar "moon-blindness," or recurring inflammation of the eyes. Formerly this was very prevalent in England, but the systematic rejection of the diseased animals as breeders has greatly reduced

* *The Breeder's Gazette*, Vol. I, p. 508.

the number of blind horses in later years. In America there is still a very wide margin for improvement. The blind stallion and the blind mare should be alike discarded, and it is well to avoid the progeny of horses that have suffered from this "recurring ophthalmia," even though their own eyes may still be apparently sound.

Among the indications that an animal has suffered from the disease are the following: A slight bluish opacity around the margin of the transparent cornea; a sunken appearance of the eye, which seems smaller than natural; the existence of an angular interruption in the regular curve of the upper eyelid about one-third from its inner end; and a tendency to shy from imperfect sight. If in addition to this there is a loss of the clear luster of the iris (around the pupil), and an undue feeling of tension and resistance when the eyeball is pressed through the lid, or if there is a cataract the evidence becomes the more conclusive. A cataract is recognized by a whitish opaque spot behind the pupil. It is best seen when the horse is led toward the stable door, so that the light may fall on the eyes from above and behind, while the interior of the stable forms a dark background. In bad cases the entire pupil is filled up by the opaque spot and the horse becomes blind on that side. An animal showing such features, or one which suffers at intervals from swelling or watering of the eyes, should never be used for breeding.

Nearsightedness is another quality which is derived from parents, and which is specially dangerous, by causing the horse to shy. It is further manifested in most cases by a peculiar bulging appearance of the eye, by reason of an extra convexity of the cornea.

The foals of horses that have suffered from moon-blindness are not all equally subject to its attacks. Much of the difference depends on the varying activity of the disease in the parent at the time of conception or during the period of pregnancy. A case strongly illustrative of this may be noted: A mare, not predisposed to *recurring ophthalmia,* had a burdock entangled in the forelock so as to be directly upon the eye, which was thus kept

inflamed and running for a length of time during the course of pregnancy. The progeny—a filly—had the eye on the same side defective, and represented by a small opaque black mass. The dam recovered, and afterward bore colts with sound eyes, as did also the one-eyed filly in due course of time. This but expresses a general law—that the disorder which is active and causes suffering at the time of reproduction is most likely to tell injuriously on the progeny. When, therefore, all the progeny inherit a constitutional predisposition to *moon-blindness*, those which are begotten or borne during a period of active disease and suffering on the part of one or both parents are most likely to become permanently blind. Another dominating cause of moon-blindness is the occurring in the predisposed animal of debility or weakness from any influence. It may be safely assumed that whatever undermines the general health or lowers the hardy vigor of such predisposed animals tends to bring on the disease. Thus, coarse, fibrous or unnutrious fodder often acts in this way. An exciting, over-stimulating diet acts in the same way. An animal that keeps sound on a diet of oats or barley may fall a victim if fed on Indian corn. Overwork, or the combination of hard work and a diet insufficient to repair the excessive waste, is equally injurious. Debilitating diseases of all kinds are equally liable to superinduce the malady. An attack of influenza, a chronic indigestion, or the presence of worms in the stomach or bowels, may be the immediate cause of *moon-blindness*, one without which the hereditary tendency might have remained latent. Some causes, however, deserve more special mention, because of their general operation or more wide-reaching effects.

It is notorious that certain countries and districts suffer more from recurring ophthalmia than others. In a general way it is the more moist and relaxing that furnish the most victims. The west of England and the whole of Ireland furnish more subjects of opthalmia than does the dry eastern coast of Great Britain. The damp, marshy and cloudy region to the north of the Pyrenees suffers badly, while in the dry, clear atmosphere of Catalonia, to the south of these mountains, the disease is almost un-

known. So notorious is this that dealers are in the habit of buying in Southern France, at a low price, horses that have had but one attack of ophthalmia, and of transporting them to Catalonia, where, as a rule, they escape any further seizure.

The effect of a damp, sunless, relaxing climate, however, is productive of a heavy, lymphatic stamp of horse, which is always more predisposed to affections of this kind than the horse of fine fiber and nervous temperament. In this respect the North American continent should be more favorable to the horse than the moister climate of England, being an approximation toward the climate of Syria and North Africa, the cradle of all that is excellent in horse flesh; yet, even in the United States, a low, marshy, damp and cloudy region is to be avoided when it is wanted to develop the highest speed or the greatest vigor and endurance. Places and climates that prove most favorable for the raising of meat-producing animals are most likely to deteriorate the horse by developing a loose, open texture of bone, a bulky but soft, flabby muscle, and an undue tendency to sluggishness and fattening. The lymphatic temperament thus indicated is that which especially predisposes to ophthalmia, and if such young animals are retained in such a climate they are particularly liable to suffer.

Close stables are hurtful in various ways. The relaxing effect of the stable upon the young horse is always marked; but this is especially so when, as in dealers' stables, the air is kept extra hot to produce a *fine coat*. The damp rising from the lungs and skin of the animals, and from the dung and urine, is especially injurious, because of its relaxing effects, but still more so because of the active decomposition which it maintains in the organic matter floating in the air, or lodged on the walls, floors and woodwork. The effect of this is seen in the great predominance of diseases of the air passages in young horses that have been recently stabled; and upon animals predisposed to ophthalmia the same disturbing influence tends similarly to the development of that affection. Apart from the debility and fever which this change brings about, it will be observed that the air of the stable

repeats, on a small scale, the damp, hot, cloudy, relaxing climate which we have seen to be the most favorable to the development of the disease we are dealing with.

For breeding and growing horses, therefore, it is all-important to secure dry, airy, roomy stables, and to keep these clean and sweet. A naturally porous or well-drained soil, a sunny exposure and a sufficiency of ventilating orifices above and below, so disposed as not to create cold draughts, are points of especial value.

Stables should be so constructed as to avoid darkness on the one hand and a full glare of sunshine striking the eyes on the other. Darkness is usually associated with uncleanliness, damp and close air; but, apart from these, it is injurious in hindering the proper development of red blood globules, which are so essential to sound and vigorous health. It further tends to weaken the eyes, and to expose them to suffering and inflammation when suddenly taken out into the full glare of sunshine. When the sunlight is reflected from snow, from white walls, or from the white dust of a limestone soil, it becomes increasingly injurious. It is well to have a stable well lighted, but the sunlight should be made to enter behind or to one side, and not to fall directly on the eyes of the animals.

How common an occurrence is the presence of hay seed or chaff in the eyes of animals. Nothing can conduce more to the development of a latent predisposition to ophthalmia. The sensibility of the eye is adapted to its situation, which is protected by the margins of the orbit against solid objects of large size, while it is especially liable to be invaded by fine particles of sand, dust, etc. A smooth marble or finger may be made to touch the eyeball without great suffering, while a grain of sand or ashes produces exquisite torture. To avoid these smaller and more hurtful bodies hay racks should be made no higher than the ordinary manger, and, if filled from above, it should be through a closely boarded chute, so that neither seed nor dust may readily drop into the eyes.

The above remarks are equally applicable to the dust of the

highway in summer. With breeding-animals especially it is dangerous to drive in the cloud of dust raised by a leading wagon, but how much more so if the horse is hereditarily predisposed to ophthalmia. In the same way we should guard the horse against the cinders flying into open railway cars, from the dust of a threshing machine blowing upon the horses engaged in driving it, the dust of a harrow driven in the same direction as the wind, the smoke of burning rubbish, etc.

In addition to the bad effects of insufficient, faulty or too stimulating food, already referred to, it is well to note that the consumption of too much sugar is liable to induce disease of the eyes. This is especially likely to result from a too exclusive diet of sorghum, or from the large admixture of molasses with the food. It may, indeed, be questioned whether the notoriously evil effects of a diet of Indian corn on the eyes is not partly due to the abundance of starch in its composition, and to the conversion of that starch into sugar in the system.

THE EYE AS AFFECTED BY THE TEETH.*

The process of teething is calcalated to rouse into activity a latent predisposition to disease of the eyes in horses. The rapid progress of teething in the horse, and the completion of the process at an early age, determines much vascular and nervous excitement about the head, and the weakest point, in many cases, being the eyes, these are too often the parts to suffer. To illustrate the influence of teething it need only be said that at three years old the horse acquires eight new grinding teeth and four front ones. A year later he acquires eight additional grinders, four front teeth and four tushes. It is small wonder that at these ages the gums and soft pad of the upper jaw swell; that the horse refuses his food, or eats with little appetite; that he drops morsels half chewed, and that he appears at times sluggish, dull and feverish. Nor is it surprising that at this age the progeny of horses that have suffered from *recurring ophthalmia* themselves

* *The Breeder's Gazette*, Vol. I, p. 536.

show symptoms of the same disease. It is this tendency to diseases of the eyes during the eruption of the permanent teeth which has drawn horsemen's attention to the *wolf teeth* as the supposed cause of the evil. The wolf teeth, however, come up with the first set of molars, and are therefore in the mouth during the whole of early life, and until the adjacent teeth—the front upper grinders—are shed. Whenever, therefore, a young horse suffers from diseased eyes, the owner or attendant opens the mouth, and finding wolf teeth concludes that these are the cause of the trouble. The wolf tooth is imbedded not more than half an inch in its socket, while the adjacent grinders, and even the front nippers, extend into the bone for about two inches. These other teeth are, therefore, far more likely to produce irritation than are the wolf teeth, and, as a matter of fact, the congestion of the palate, familiarly known as *lampas*, occurs close behind the front teeth, and not near the wolf teeth. In the shedding of the back grinders, too, it is not at all uncommon to have so much irritation caused that it extends to the throat and causes sore throat and cough. But around the insignificant wolf teeth it is rare to find any irritation at all, and that only when they deviate from their true direction. The temporary recovery from sore eyes after the extraction of the wolf teeth is just what would have happened had the teeth been left in place, and proves only that the disease appears and disappears alternately.

The excitement attendant on teething is natural, yet it is well to check this when it threatens to become severe, or to rouse sympathetic inflammation of the eyes. If cositiveness appears during the process, the substitution for a portion of the diet of soft mashes of wheat-bran, of fresh, succulent grass, of roots, apples, or ensilage will prove beneficial. If these are not available or are ineffective, one or two ounces of Glauber's salts may be given daily in the feed. If the old teeth do not fall early and spontaneously, but remain entangled on the crowns of the new ones after the latter have cut the gums, they should be removed; if the gums become red, swollen and tender, a slight scarifying of the suface so as to let a little blood will usually relieve; and if

new teeth, and especially the tushes, produce tension and pain by their pressure before cutting the gums, their eruption should be assisted by a deep incision with the lancet, down to the hard tooth substance.

UMBILICAL HERNIA IN YOUNG FOALS.*

This condition is usually very easy to recognize. A pouched or pyriform swelling appears in the median line of the abdomen, immediately below the navel, which, on manipulation, is felt to contain movable contents, which glide readily on each other and can be easily returned into the abdominal cavity by pressure. Then in the center of the navel can be felt an opening of variable size, which may admit one, two or four fingers. On relaxing the pressure the sack fills up again more or less promptly and fully. When manipulating the contents, and during their return, there will usually be felt, and even heard, some gurgling from the admixture of liquids and gases in the contained intestine.

It is needless to mention here more than one mode of treatment that should serve every purpose in the very young, in which the tissues of the navel are still embryonic cells, and the opening, therefore, easily closed. Procure a piece of sole leather from four to six inches square to apply upon the navel after the mass of the intestines has been passed back into the belly. To each corner of the leather pad attach an elastic band, and bring the same upward around the body, tying them over the spine. Pass a band around the lower part of the neck to act as a collar. From the lower part of this collar carry an elastic band between the fore legs and attach it to the anterior border of the leather pad. From the same collar, on each side of the shoulder, carry an elastic band back on the side of the chest and tie it successively to the two elastic bands which encircle the body. The essential point is that all of the bands should be elastic, so that they yield and accommodate themselves to the movements of the abdomen in breathing and of the body in all its varied motion.

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* *The Breeder's Gazette*, Vol. I, p. 281,

If a similar bandage is applied with *inelastic* bands drawn tight enough to keep the pad in contact with the umbilicus in all the breathing movements it is liable to cause severe, and even fatal, straining. As an accessory to the pad and elastic bands may be applied on the umbilicus a liberal amount of melted pitch, or pitch and wax, which will bind the band and skin and still further secure against any descent of the hernia. If by these means the bowels can be prevented from descending through the opening, the walls of that opening will speedily contract and become fibrous, and the possibility of future protrusion will be obviated.

In cases of longer standing—in colts, for example, of several months old—the embryonic cellular tissue around the navel has already been developed into fibrous material, so that the contraction and closure is not so speedy, and in such cases it may be desirable, when the hernia is small, to leave it to nature—at least until the colt is one or two years old. In such cases a spontaneous cure often ensues; but the opening is rarely so completely effaced, nor so strongly closed, as when effected by bandage immediately after birth.

The explanation of the spontaneous recovery is this: The lower part of the abdomen in the adult horse is occupied by the large intestines to the utter exclusion of the small. In the young foal these are scarcely larger than the small intestines, and easily protrude through any natural or artificial orifice. As the foal grows, however, and subsists more and more on coarse and solid food, the large intestines gain in size, and in mature life they vary from four to twelve inches in diameter, at different points. The blind gut, which is one of the largest, lies obliquely across above the navel, and by its great bulk forms an internal pad, which most effectually shuts off the small intestines from this region.

"SCOURS" OR DIARRHŒA IN COLTS.

In all young animals there is a certain amount of secretions from the liver, pancreas, stomach and bowels prior to birth, and when the new being comes into the world these products are accumulated, in the form of firm, tenacious masses, in the last gut.

At first the bowels are torpid, and the stiff, tenacious contents, or *meconium*, obstructs all progress. The natural laxative, which nature has furnished to clear away this product, is the milk first secreted, and when abundant this usually serves every purpose. But from various causes this milk may be deficient in amount or altered in quality, and may fail to produce free evacuation of the bowels. Then follow cositiveness, impaction of the bowels with the waste products of the digestion of milk, decomopsition of these products, impairment or alteration of the secretions of the whole digestive apparatus, and, finally, irritation, excessive watery secretion, unnaturally active movements of the bowels, perhaps even inflammation, and, of course, scouring. For this condition, which is a very common one, the preventive is to watch the foal closely for the first twenty-four hours, and, if the bowels are not freely moved, to give a dose of three ounces of castor or olive oil, with a tea-spoonful of laudanum.

In the young the liver is relatively far larger and more active than in the adult. As might be expected, it is at the same time more liable to disorder. In many cases of indigestion in young foals the extreme fœtor of the discharges, the coated appearance of the tongue, and the yellowness of the membranes of the eyes and nose, testify to the existence of this derangement. In such cases, after the operation of the oil, much good may often be derived from one grain of calomel and twelve grains of chalk, intimately mixed, and repeated two or three times a day.

Anything that affects the general health of the mare is liable to modify the milk. When mares are used in harness during lactation, it occasionally happens that a fretful animal becomes so fevered that the quality of the milk is materially altered, and the foal, coming to her hungry, gorges itself with what acts like a veritable poison, inducing indigestion, with skin eruptions or diarrhœa. So it is with other unhealthy conditions of the mother. In all febrile, wasting, or disordered states, the milk is more or less altered, and every such alteration is a threat to the sound digestion of the foal, and may prove a proximate cause of scouring. With some it is a common practice, after the mare has

been excited by work, to keep the foal apart until all the milk found in the bag has been drawn off, since they justly conclude that what is secreted later, when the period of excitement is past, will prove more wholesome. In the same manner we ought to correct, as far as possible, any alteration of health on the part of the dam.

We know that the relative amount of water and solids in the milk is greatly affected by the nature of the food. A suckling animal, in good health, has a richer and more concentrated milk when fed on dry hay, and especially with a liberal supply of grain. Now, the very richness of this milk may unduly stimulate the digestive organs of the young animal, and any such undue stimulation borders on disease. A slight congestion of the stomach, or a temporary suspension of its secretions, may lead to the formation of larger masses of curd, which are difficult to dissolve, and lie but as permanent irritants in the abused organ. Although the best course is to prevent the formation of these, it is often needful to treat them, and perhaps nothing will serve our purpose better than a dose of castor oil, as above advised, to be repeated in three days; and in the interval two table-spoonfuls of a solution of rennet in wine, repeated morning, noon and night of each day. To prevent recurrence of the indigestion the rennet may be continued for some time, and the mare should be allowed an abundance of water, not too cold, and one or two soft mashes daily. The rennet solution may be prepared by taking one-eighth of the fourth stomach of a calf and steeping in a pint of wine. Water may be substituted for wine, if a sufficient amount of salt, or a few drops of carbolic acid are added, to prevent putrefactive change.

For the suckling mare grass is unquestionably the natural food. Left to nature she brings forth her young at the period when pastures are luxuriant, and on this diet her milk is abundant and good, but not too rich nor concentrated; and yet even green food is not always most conducive to the health of mare and foal. Occasionally in early spring the fresh grass is so rank, and its growth so rapid, that it contains an excess of water;

and even its constituent organic elements appear to differ from those of a less rapid growth, and the result is acute indigestion and violent diarrhœa. This, which shows itself primarily in the mare, may be propagated in the foal as well, by the morbid products secreted in the milk. Nothing is more certain than that very many chemical agents, introduced into the system of the mother, pass out largely by the milk. It is an old practice to give a dose of salts or other purgative to the mother, with the view of acting on the bowels of the offspring. Poisons, too, taken into the system of the mother, will often pass out in the milk, and affect the more susceptible offspring rather than the less impressible nurse. Hence it is that green food that has been grown under unusual conditions, fodder that has been spoiled in harvesting, impure waters with an excess of decomposing organic matter, and mineral waters containing laxative salts, may appear to act even more severely on the sucking animal than on its dam, through which these were derived. The notice of these things is, perhaps, sufficiently suggestive to lead to their correction when they are found to exist. It need only be stated that green food, which is actively irritant when used alone, will often prove harmless when employed in connection with grain or other dry food; but occasionally this will fail, and each case must be judged by its own results.

Confinement in close buildings is inimical to mare and foal alike. In both it induces a relaxed, weakened condition, which lays the system open to health-disturbing causes. The effect on the mare impairs the quality of the milk, and this in its turn reacts on the foal, which, thus placed between two fires, is doubly liable to suffer. But close confinement is too often associated with impure air and filthy surroundings, and nothing can well be more hurtful to health than this unhygienic combination. After foaling, as before, mares should have the means of taking free exercise, and if in early spring they can not do this in the pasture each ought to have the run of a yard connected with a dry, comfortable shed, where she and her foal may use and develop their locomotive organs and strengthen their constitutions.

Perhaps nothing is more hurtful to the young than a cold, damp bed. Suddenly transferred from a warm medium to the cold of early spring, it is of no small importance that the young animal should be protected against the excess of cold which comes of damp and evaporation, or even freezing. The sympathy between the skin and the bowels is of the most intimate kind, and in earliest youth, when the susceptibility of the bowels is so great, the chilling of the surface often leads to disastrous congestions of the bowels and fatal scouring.

Similar to the above is exposure to cold rain storms. A passing shower may do no harm, even if cold; but a prolonged exposure to rain, with a low temperature, is terribly trying to the system of the new-born foal, and often leads to disorders of the digestive organs, with persistent and fatal diarrhœa.

Only two more conditions may be referred to, and both are connected with a more advanced period of colthood than are those already mentioned. When the foal begins to feed he may suffer from all those conditions of the food that prove noxious through the milk of the mother. A feed, for example, of a too stimulating grain, or of a too rank and aqueous grass, of fodder that has been badly harvested and rendered musty or bleached and fibrous, of grain or hay that has been altered by ergot or smut, and of roots and tubers that have been frosted or diseased —these and others may at times give rise to irritation in the as yet comparatively inhabituated stomach, and scouring is a not distant consequence.

The second evil result of faulty food and water is the presence of worms in the intestines. All the round worms of the intestines of the horse can live in water and moist earth, or in fresh vegetation, in their early and immature condition. Thus they are liable to be taken in continually with the food and water, and developing in the intestines they lay eggs almost without limit as to numbers, to be hatched and sped on the same noxious course. Hence it is that in pastures that have been grazed by horses year after year, and with drinking ponds and shallow wells into which the washings of the surface can find their way, the colts are par

ticularly liable to worms; and diarrhœa from this cause is by no means unfrequent. In such a case there is the general unthrifty appearance of the wormy animal, and the rubbed, frizzled appearance of the hair at the root of the tail which bespeaks the itching of the anus. The most marked symptom, however, is the presence of the worms in the dung, and these can usually be found if carefully sought for. In such a case it is well to give a dose of physic to clear away the mucus in which the vermin live; and if this is associated with a vermifuge the majority of the parasites may be expelled at once. Six table-spoonfuls of castor oil, with two or three tea-spoonfuls of oil of turpentine, according to the size of the foal, should be well shaken together and given as one dose. After this has operated twenty grains of powdered sulphate of iron and ten grains of santonin may be given daily for a week, when the dose of oil and turpentine may be repeated, which will usually clear away all the parasites that remain in the bowels.

In conclusion, a caution is needed against a too common method of treating diarrhœa from the outset with opium and astringents, with the view of cutting short the discharge. As a rule, scouring is but an indication of the presence in the stomach or bowels of some cause of irritation; and all attempts to quiet the irritation by opium or astringents serve but to imprison the cause of trouble, and thus to prolong its irritant action. The soundest policy in all such cases is to expel the disturber with a bland laxative like castor oil, guarding its action, if need be, by a little laudanum or other soothing agent; and only later, when the irritant has been expelled, to check the discharge and shelter and protect the irritated bowel by weak solutions of gum arabic, of slippery elm, or by well-boiled linseed tea or starch. But even then these must be used in moderation lest they should produce a secondary constipation, which will prove even more hurtful than the diarrhœa. A good prescription for this stage, and which may be repeated once, twice or thrice a day, as may be necessary, is eight grains of kino, one ounce tincture of cinnamon, one-half drachm of gum arabic and two drachms of chalk.

To sucking animals this may be given along with the preparation of rennet, and should only be continued so long as the bowels are loose and irritable.

STRANGLES OR DISTEMPER.

However strangles may be produced, or whatever accessory causes may favor its development, there can be no doubt that once in existence it can be propagated by contagion. We frequently see all the young horses on a number of adjacent farms suffering at once from this malady, while a farm entirely surrounded by these, but which has had no direct equine communication with them, maintains a clean bill of health. But let one of the sick colts be introduced into the latter, and speedily all the horses unprotected by any antecedent attack present the unequivocal symptoms of strangles. Lastly, in many different cases the malady has been conveyed from horse to horse by inoculation, thus attesting in the most undoubted manner the presence of contagion. We are the more particular in enforcing this fact of contagion that most English authors deny its existence, and thus blind their readers to a most important measure of precaution. In many seasons the affection assumes a uniformly mild and regular form, and passing promptly through all its stages, is invariably followed by a satisfactory recovery. In other seasons it shows the greatest tendency to an irregular course—to a tardy and imperfect maturation of the swellings, to inflammation and abscess in unwonted situations, and to secondary formations of matter in distant and vital organs, with most injurious or fatal results. If we conclude that the disease is in the air, or in the system only, as English authors assert, we may well decide that we can do little to hinder its appearance in the more fatal seasons, or to favor it in the safer and milder ones. If, however, we recognize the truth that the disease may be to a great extent prevented by seclusion and disinfection, while its development can be secured by exposure to contagion, we can protect our studs in the less favorable outbreaks, and even pass them through the malady in the milder ones, thus saving many lives and many

more cases of *roaring*, *thick wind*, *chronic coughs*, and other affections of the air passages.

Strangles is usually preceded by a period of incubation, manifested by a staring coat, loss of condition, dullness and languor, with perspiration and fatigue under slight exertion. These are followed by rise of the body temperature, heat and clamminess of the mouth, redness of the eyes and interior of the nose, and a watery distillation from both, driveling of saliva from the mouth, accelerated breathing and pulse, costiveness, scanty, high-colored urine, and increased thirst. Now the characteristic swellings appear in front of the throat and between the two branches of the lower jaw. This is a uniformly rounded swelling, hot and tender, firm and resistant in the center, but softer, more doughy and pitting on pressure on the surface and around the margins. After two or three days, in the regular cases, the center of the swelling softens and fluctuates from contained pus, and a few days later still it bursts, discharging an abundant white, creamy matter, and speedily heals up, this being accompanied by a restoration to vigorous health.

Sometimes the swelling is situated in the throat, and may press inward on the pharynx, preventing swallowing, and causing a rejection of water and food by the nose. In other cases it presses on the larynx, shutting off the air from the lungs and causing the most difficult stertorous breathing, or even proving fatal by suffocation. At other times the swelling beneath the lower jaw is replaced, or supplemented, by similar swellings in distant parts of the body, but mainly in the groups of the lymphatic glands, in the neck, shoulder, groin, chest, abdomen, or elsewhere. In these cases the danger is always greatly enhanced, but it will be proportionate to the vitality of the organs in which the inflammation and suppuration supervenes. In some instances the swelling first appears in its natural situation under the jaw, but fails to come to a head, remaining hard and indolent for an indefinite length of time. In all such cases the strength is much run down, and there is a great tendency to the formation of matter in important internal organs, and especially in the

brain, with fatal results. In such cases, too, there is a great tendency to enormous dropsical and bloody effusions in the head and limbs, as the result of debility and a very depraved condition of the blood.

Suggestion has already been made of the great importance of guarding against exposure to contagion, to change of locality, or to any of the exciting causes of the disease, when that shows any tendency to assume an irregular or fatal form in a district. Disinfectants even may be used in the stables, such as fumes of burning sulphur diluted so as to be breathed without irritation, or the exhalations from shallow basins of carbolic acid and alcohol. We may add the further precaution, not to expose to cold, wet, nor exhaustion during convalescence from this affection, as many cases of irregular course and untoward results have occurred from the lack of just such care.

In the treatment of the affection much more reliance is to be placed on sound hygienic measures than on medication. The patients should be fed liberally on scalded or boiled grain, or wheat-bran, and if this can be given from a nose-bag it will soothe and relieve the air passages, and greatly hasten the formation of matter and recovery. This should be done at least twice a day. No less important is the continuous application of warmth and moisture to the swelling between the jaws. This may be accomplished by persistent fomentation with warm water, by the application of a poultice in a bag of thin cotton, or, better and more conveniently, by enveloping the head in a sheet, with holes cut for the ears and eyes, and laced down the middle of the face, and inserting a large wet sponge, so that it may lie in contact with the swelling. This can be kept saturated with warm water, by pouring a little into it occasionally. When the matter approaches the surface, and appears to be separated from the finger by a thin layer of skin only, it should be freely opened with a sharp knife; and the fomentations may be kept up until the surrounding hardness has entirely disappeared. The swellings in unwonted situations should be similarly treated, so as to seek a discharge of the matter externally. The formations in internal

organs are too often fatal, because of the vital importance of the structures involved.

This is a malady through which most horses pass once in their lives. In this respect it resembles measles, scarlatina and other eruptive fevers of children. Precisely what are the conditions which leads to its development it may be difficult to state in so many words, but there can be no doubt that among the many predisposing causes change of locality holds a very high place. Horses moved from one county or State to another, from a hilly to a flat region, or the reverse, from inland to the seaside, or from the country to the town, are those in which the disease is most apt to be developed. So strong indeed is this influence of altered climate that a second and even a third attack may be determined in the same animal by extensive change of residence. In horses, on the other hand, kept continuously in the same locality, a second attack is very rare.

DISEASES PECULIAR TO BREEDING STOCK.

PART II.

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THE STALLION—EXTERNAL INJURIES.

The accidents and ailments to which the stallion may be said to be especially liable are comparatively few. Among the external injuries to which he is exposed are those he may receive while he is about to serve the mare; such as bruises, lacerations, sprains, injuries of the sexual organs, etc., and which may be caused by the mare's resistance, from want of proper assistance of the keeper, or by the too great eagerness and impatience of the stallion himself. Among the requirements to his early restoration to service, as well as to successful treatment, when injured in this manner, is total abstinence from sexual intercourse. Minor wounds, or slight hemorrhage may be

treated with frequent applications of cold water or mild astringent lotions. Considerable bleeding, consequent upon more extensive lacerations, may require the use of hot iron or ligatures, and that the wounds be closed by stitching or by strings of sticking-plaster. Where inflammatory action exists, besides internal sedative remedies (aconite, belladonna, fifteen to twenty drops of either) use locally either cold or warm applications; and when œdemic or dropsical swelling exists apply warm aromatic decoctions, frequently renewing the same, and exercise the animal several times daily. Extensive or persistent dropsical swelling of either the sheath or the penis may be relieved by longitudinal free lancing and continued warm bathing. In cases of profuse suppuration apply astringent lotions (alum, sulphate of zinc, or acetate of lead; strength, one to twelve of water). Fistulas should be slit open to give free escape of matter and facilitate applications of remedies (nitrate of silver) to destroy false membrane; thereafter, zinc ointment, carbolized cosmoline, etc.

INFLAMMATION OF THE PENIS.

It is evidenced by pain, heat, swelling, more or less inability to extend or retract the organ, painful urinating, a straddling gait, more or less depression of spirit and loss of appetite. Most frequently caused by kicks from the mare, injury by hairs of the mare's tail obstructing free entrance to the vagina, etc. After cleansing the penis and the sheath with warm water and soap, apply zinc or lead ointment, or, if much swelling prevails, use frequent bathing with hayseed tea, or decoction of other aromatics with vinegar. In case of abscess-formation, besides frequent attention to cleanliness, use injections of solutions of sulphate of zinc or sulphate of copper (from one to two drachms to a half-pint of water). If the stallion is unable to retract or retain the penis within the sheath, it will be necessary to support the member in a horizontal position by means of a broad linen bandage or sling fastened over the loins. The diet should be loosening and spare.

INFLAMMATION OF THE TESTICLES.

This is evidenced by a stiff, straddling gait, or more or less lameness; swelling and pain of one or both testicles, including the testicular cord; total loss of spirit and ability to service, and which latter condition, in severe cases, may become permanent on account of structural disorganization of the testicles. Treatment should be conducted as indicated in the previous case. The testicles should be supported by the use of a suspensorium. Scarification must never be employed in enlargement of the testicles, except in the case of abscess-formation. Chronic enlargement or induration should be counteracted by the use of weak mercurial ointment, to which may later be added a small proportion (one to twelve or sixteen) of iodine; but this latter should never be used while local pain or inflammation remains.

CANCER OF THE PENIS AND THE SHEATH.

This condition is generally mistaken for warts, on account of some similarity of appearance. It is generally located at the edges or inside of the sheath and at extremity or spongy body of the penis. In appearance it is a tumor of varying size, with a granulated or sprouting surface, of a dirty red color, the edges of which bleed on slight provocation, and from which a fetid ichor is discharged. The skin and underlying tissue surrounding these tumors are generally more or less thickened and knotty. When located near the course of the urethra there may be more or less difficulty in urinating. There is a possibility of this disease being transmitted by the genital parts of the stallion to the mare, and *vice versa*. The best course of treatment consists in the entire disintegration of the tumor by aid of the red-hot iron, and the subsequent application of ordinary healing remedies. There is a kind of tumor affecting the genital organs, which is of a non-contagious nature, called sarcoma, and which may be removed by the same means.

PROLAPSE, OR PARALYSIS OF THE PENIS.

Prolapse may exist without a paralytic condition of the organ, or it may be due to paralysis, either local or affecting

other portions of the posterior part of the body. We will, however, confine our attention to the local condition. Prolapse, with or without co-existing paralysis, may be caused by various local injuries of a mechanical nature, and it may co-exist with, or be due to inflammation of the penis, to rheumatism, etc. Depending upon possible complications of a more general or extensive nature, the condition may be either of temporary duration, amenable to treatment, or it may result in permanently disqualifying the animal for stud services. One of the first requirements to successful treatment consists in the use of a suspensorium or loin bandage. To the dorsum and sides of the penis apply tincture of iodine, or turpentine, once daily, by light penciling of the parts, and internally administer spinal stimulants, such as nux vomica (fifteen grains to a scruple, twice daily) with valeriana (one ounce of the powdered root).

SCROTAL HERNIA.

The descent of a portion of the intestines, through the inguinal canal, into the scrotum or bag which contains the testicles, is sometimes met with in entire males of all ages. It may be congenital, or acquired soon after birth, or at any time in after life from a variety of causes, such as violent efforts, jumping, kicking, violent throwing or rolling during attacks of colic or bloating, too frequent and excited copulation, violent exertions in pulling heavy loads, especially up-hill, etc. Sometimes the descent of intestine into the scrotum is not due to any of the causes named, but may occur from a relaxed condition of the abdominal muscles, or a too spacious inguinal canal (abdominal ring). In young colts scrotal hernia does not always manifest itself by sudden or violent symptoms; in fact, the animal may to all appearance suffer no inconvenience; but as there will always be danger of strangulation, with its sequels of inflammation of the bowels, gangrene of the incarcerated portion and death of the animal, such cases should be attended to as soon as they are discovered, both in young and old. Whenever colic occurs in stallions a careful examination of the contents of the

scrotum should never be omitted. It will be evident to any thinking man that, in a case where violent symptoms of colic are induced by strangulation of a portion of intestine in the scrotum, the administration of medicines, instead of remedying the case, will only tend to hasten a fatal termination. The cause of the symptoms being of a mechanical origin and nature, can be remedied only by mechanical means, aided by proper medicinal adjuncts. In young colts, when no untoward symptoms exist in connection with scrotal hernia, the return of the intestinal contents of the scrotum may be effected by taxis; that is, by laying the animal on its back, raising the hinder part of the body from the ground as far as possible, and by gentle manipulation of the scrotal contents cause their return to the abdominal cavity. The animal should then be laid on its side and allowed to rise as quietly as possible. A return of intestine into the scrotum may not occur again; but should it happen more than twice it will be best to castrate the animal without unnecessary delay, the removal of the testicles being done by the so-called covered operation. It would be highly improper and dangerous to castrate such an animal in the usual manner by opening the tunica vaginalis (so-called striffing or white sack), which is in direct connection with the abdominal cavity. Scrotal hernia in older animals should be treated in a similar manner; that is, the animal should be made resistless by the proper administration of anæsthetics, probably the least dangerous of which is the following combination, which is almost invariably used by myself in all animals, viz.: One part of alcohol, two parts of chloroform, and three parts of sulphuric ether, administered by saturating a sponge, which should then be held close to (not against) the lower nostril, while a towel or an empty sack is laid loosely over the sponge and half of the head. Both nostrils should never be covered by the sponge. When entirely under the influence of the anæsthetic the animal should be laid on its back; sacks filled with oats or packed with hay should be placed under the crupper and loins to raise that part of the body from the ground; equilibrium of the body being maintained by strong hands holding the four limbs;

the oiled hand and arm inserted through the rectum; and by manipulation of the intestines, simultaneously with judicious manipulation of the contents of the scrotum, the intestinal contents of the latter may be entirely returned to the abdominal cavity. Should, however, these efforts prove unsuccessful nothing remains but to resort to a surgical operation, the particulars of which I omit describing, as such an operation could be successfully performed only by a veterinary expert. Should the contents of the scrotum be successfully returned, without surgical operation, it would be prudent to castrate the stallion by the covered method, to avoid future similar occurrence. Many a fine stallion, supposed to have been affected with spasmodic colic, undoubtedly suffers the most excruciating pains of strangulated scrotal hernia, and dies in the hands of unsuspecting owners or attendants, with the real cause of suffering and death undiscovered, for which reason I have discussed this subject at length.

WATERBAG, SO-CALLED.

This condition may exist as a simple dropsical (œdematous) infiltration of the connective tissue of the scrotum, and as one of the sequels of influenza or other internal diseases. Water or serum, contained in the scrotal sac, together with the testicles, may be the result of local injury or abdominal dropsy. In old stallions this condition may, and does often, co-exist with degeneration or chronic diseases of the testicles. It is also met with in young, weakly colts, as a result of general debility. Simple dropsical infiltration may be treated locally by stimulating applications, and internally by the administration of diuretics, succeeded with tonics, liberal keep and proper daily exercise. Accumulation of water in the scrotal cavity may be returned to the abdomen by placing the animal on its back and raising the hinder quarters; and the absorption and elimination of the fluid may then be accomplished by the administration of laxative or diuretic remedies, succeeded with tonics, liberal keep and exercise. When the aqueous accumulation in the scrotum is due to, and co-exists with, degeneration or enlargement of one or both testicles, castration may be resorted to.

EXCESSIVE VENERY (*Satyriasis*).

A condition in which excessive sexual excitement occurs at frequent intervals, even almost uninterruptedly, may exist in both sexes. In the stallion ejaculation of semen may occur during the paroxysm of erection and excitement, or just before sexual connection. The condition manifests itself mainly when the stallion is kept within the sight or smell of mares, or in the same stable; seldom when he is kept absolutely secluded. It may be a consequence of idleness, together with a want of sexual intercourse, and especially when the animal is kept on very rich and stimulating food; otherwise, a constitutional predisposition to excessive virility may exist. The evil may be remedied by seclusion, more frequent sexual intercourse, less nutritious food, the administration of occasional laxatives; also, by the use of bromide of potassium in two-drachm doses; or camphor with nitrate of potassium, respectively one and two-drachm doses. Castration as a last resort.

NON-EMISSION OF SEMEN—"PROUDNESS," SO-CALLED.

The question is frequently asked: "What causes a stallion to dismount proud?" or "What can be done for a 'proud' stallion?" This condition is a variety of sterility in which sexual intercourse is not finished with an ejaculation of semen, either because that fluid does not enter the urethra, or because its forcible expulsion is prevented by some obstacle in the course of the urethra. Non-emission may be congenital or acquired, and permanent or temporary. It may be, and probably most frequently is, the result of either masturbation or over-taxation of the sexual organs. Dr. Howe says on this subject: "The power of erection remains intact, but the patient exerts himself in vain to produce an orgasm. This condition may continue a few weeks, disappear and then return. It is by no means a permanent condition, but it may lead to sterility and impotence. Some writers say that it is due to spasm of the orifices of the ejaculatory duct, which prevents the passage of the seminal fluid into the urethra; others, that it is due to a lack of secretion in

the various glands. This latter view, however, is not tenable, because such patients are subject to nocturnal pollutions as a result of lascivious dreams. It is more than probable that there is a temporary paralysis of sensation existing in the prostatic portion of the urethra, in the ducts, and perhaps in the vesicles. This lack of sensation prevents the reflex muscular action necessary for the propulsion of the semen."

This latter view coincides with my opinion stated above as to the most frequent causes of this condition in stallions, namely: sexual abuse or over-taxation; and the treatment which I have generally recommended, and which has been most successful, has had for its object to restore the sexual powers to their normal condition by remedies which tone up the system at large and excite the reflex activity of the genito-spinal center. Thus the following combination may be used twice or thrice daily during one week, viz.: Half an ounce each of tincture of iron and Fowler's solution of arsenic, and two drachms of tincture of nux vomica, given in half a pint of flaxseed tea or water sweetened with molasses. During the following week may be given, twice or thrice daily, half an ounce of fluid extract of damiana and one ounce of tincture of valeriana, in half a pint of sweetened water. Meanwhile, frequent bathing with cold water should be applied along the urethra, from the anus downwards; and the stallion should be withheld from service during at least one month.

SEXUAL SLUGGISHNESS.

Among the causes of sexual indifference in the presence of the opposite sex in heat may be mentioned too long continued abstinence or sexual restraint, over-taxation of the male sexual organs, abnormal condition of these, other internal diseases, insufficient or innutritious food, general debility, obesity, etc. Treatment consists in the removal or avoidance of the causes; when indicated, nutritive and stimulating food, liberty out-doors with mares. To force sexual activity by stimulating or irritating nostrums does not generally prove permanently successful.

SPERMATORRHŒA.

This is a condition in which the semen is discharged without friction of the male organ. It is one of the consequences of masturbation, and may also result from debility of sexual organs from over-taxation of these. Treatment consists in the prevention or avoidance of the causes, isolation, frequent cold applications locally, and the administration internally of tonic and astringent remedies, such as iron, sulphate of zinc or sulphate of copper, in one-drachm doses.

VESICULAR ERUPTIONS ON THE PENIS.

Phlyctenoid vesicular eruptions on the penis are sometimes met with in stallions, and are by some regarded as a non-malignant species of chancre. It is a pellucid vesicle containing a serous fluid, which sometimes also occurs in young stallions that never have been used for service. The vesicles, after bursting, leave small ulcers, which readily heal when cleanliness of the parts is attended to. Otherwise they may become more or less aggravated, and incapacitate the animal for service. During the eruption of the vesicles more or less local pain and inflammation exists. An animal thus affected should not be used for service. Treatment consists in frequent bathing, first with a solution of one part of Goulard's extract and ten parts of water. When inflammation has subsided use frequent applications of a solution of alum in water, and cleanse the parts with soap and water. In aggravated or protracted cases use frequent bathing with a solution of one part of chloride of lime in twelve to fifteen parts of cold water. Internal remedies are generally not necessary.

FOUL SHEATH.

Accumulation of sebaceous matter, cuticular desquammation and other deposits within the cavity or folds of the sheath, often cause considerable local irritation and consequently more or less swelling of the sheath. This latter condition may also be due to accumulation of serum in the areolar or subcellular tissue, in consequence of local or general debility, or from some consti-

tutional cause; and the swelling of the sheath, from whatever cause, may exist to such an extent as to impede the extension or protrusion of the penis, and cause the animal to acquire the habit of discharging the urine within the sheath. The irritation already existing within thus becomes aggravated; decomposition of the accumulated greasy substances is thereby enhanced and putrescence and fetor ensue. During summer this may attract flies, which "blow" the parts and cause accumulation of myriads of maggots within the sheath. Continued irritation may produce more or less local inflammation and ulceration, and ultimately impair the general condition of the horse. When soap is used in cleansing the parts they should be rinsed with clean water thereafter. Oil or greasy substances should never be applied after cleansing, as is frequently done, for these substances are apt to decompose and cause renewed irritation. If the parts were for some time daily cleansed and then bathed with a solution of chlorinated lime, in the proportion of two ounces to a quart of cold water, gradual improvement and a subsequently permanent healthy condition would be likely to result. The use of this solution would also prevent the appearance of maggots. The horse's general condition should be improved by liberal keep, the administration of tonic remedies internally, and, if he is used for work, by lessening or discontinuing the same for a sufficient length of time.

MASTURBATION.

It occurs to me that I should not close my remarks on the most common ailments to which the stallion is subject without referring to an evil with which I presume all of my readers are familiar. In fact, the subject of masturbation, or self-abuse, is one of considerable interest and importance, not only to horsemen, but to all breeders of live stock. It is a remarkable fact that our literature on live-stock matters almost entirely ignores the subject. There certainly can not be any impropriety in discussing this matter in a work entirely devoted to the interest of breeding, especially when we consider the often serious results

of the practice and the inconvenience and trouble it often causes during the season of training or when, for other reasons, the stallion is withheld from service. I remember several instances where the result upon the health and usefulness of stallions was of so serious a nature that castration was resorted to as the only effective remedy. The too frequent practice of masturbation by, and its evil effects upon, the little stallion King Phillip, with a record of 2:21, was the reason given for castrating him.

There are various causes of this habit. "Idleness begets vice," is an adage applicable to a great extent in the case of self-abuse in the males of our domestic animals, many of which, especially the better-bred and more valuable ones, being fed on stimulating food and kept idle most of their time. But besides idleness and restraint of sexual intercourse, there are other causes of the habit, among which may be mentioned special generic disturbances and excessive generic potency, and which are more frequently met with in the bull than in the stallion.

When masturbation is practiced frequently organic disease of the testicles may result; also, weakness of the loins, loss of power of propulsion, loss of flesh and general emaciation; spermatorrhœa, as well as so-called clap, besides impotence, may supervene, and these so much the sooner if the animal is kept on low diet, with the idea of thus lowering his sexual excitement.

The subject of prevention is of course one of great importance. If the animal practices masturbation by the aid of his own body or limbs, it is next to impossible to prevent the same. Chastisements are of no use, and shame is out of the question. Among the remedial measures are unrestrained liberty outdoors, but which, especially with the stallion, is not generally practicable; also moderate work in the field or on the road, and regular but moderate use in the stud or herd. The main object is to prevent the exercise of the habit, if possible, but no means have been devised by which this can always be done successfully, especially when the habit has been long indulged in. The means adopted in human practice can not very well be carried out with the same result. Among these we may, however, mention occa-

sional blistering of the prepuce, or ringing it with silver wire, somewhat similar to ringing of the nose in swine. While the habit, by these or similar means, and by constant watching, or by applying a straight-jacket during the night, may prove successful in the human family, such stringent measures can not be effectually applied in the case of animals, as the chances are that when the restrictions or applications are omitted, or after awhile, the animal will return to its old habits. Internal remedies, such as bromide of potassium, continued for some time, reduces sexual desire and potency, but it is also apt to produce great weakness and emaciation, and could not be continued without danger for any length of time. Faradization of the spine has in some instances been used with benefit against self-abuse, but this is also likely to be of only temporary benefit; and, so far as I know, there is no sure cure for the evil. In inveterate cases, where the effects of masturbation have extended so far that the animal refuses to notice the opposite sex in heat, nothing remains but to castrate him and thus preserve his usefulness for other purposes.

CRYPTORCHIDS ("RIDGLINGS," SO-CALLED).

In common parlance, the appellation of ridgling is given to a stallion in which either one or both testicles have failed to descend into the scrotum. In the cases where one testicle has descended, the animal may serve the purposes of a sire and prove as fertile as if both testicles had descended. But the testicle or testicles that fail to descend into the scrotum, and are retained in the abdomen or the groin, are generally small and undeveloped, and now and then atrophied through fibrous or fatty degeneration. As a result of these malpositions or morbid changes, cryptorchids have generally been considered to be absolutely sterile, although they were known to have strong sexual desires and enjoy the capacity for copulation and ejaculation. While as a rule the ejaculated fluid is devoid of the fecundating germs, termed spermatozoæ, exceptional instances have occurred where such males have proved fertile, and where consequently the fluid must have contained spermatozoæ.

THE BROOD MARE—BARRENNESS.

A mare should not be considered barren because she does not get in foal, even after repeated service by one certain stallion, for it often occurs that a change of stallion proves effective. The causes of barrenness in mares are numerous, and among the most frequent are a phlegmatic temperament, or the reverse, excessive sexual excitement; also, reduced vitality, due to poverty of constitution, overwork, innutritious food; or the reverse condition, that of obesity; too great sexual excitement and violent efforts in the approaching stallion, especially if he is large and powerful, while the mare is young and this her first experience; or the reverse, when the mare is small, old, overworked, in poor condition and low-spirited. Among causes of a mechanical nature may be mentioned obliteration or stricture of the vagina; supersensitiveness, with spasmodic closure of the vagina; vaginal or uterine tumors; engorgement or induration of the neck of the womb; obliteration or great narrowing of the canal of the neck of the womb, or its closure by glutinous exudation; occlusion of the fallopian tubes (which connect the womb with the ovaries); morbid or abnormal condition of the ovaries. All morbid discharges, due to retention of a portion or all of the after-birth, or to catarrh or leucorrhœa (so-called whites), effectively prevents pregnancy. I coincide with the opinion of experienced breeders, that pasturage upon red clover is among the fertile causes of barrenness in mares; and I believe that impotence in mares in this case is due to the honey contained in the flowers, this opinion being based upon the fact that a continued consumption of pure honey will produce impotence in both sexes of mankind. Nymphomania is also a cause of barrenness.

Many of the conditions named above are of a permanent character; others are amenable to treatment, and may be successfully avoided, remedied or removed. Thus, too great excitability in the mare may be overcome by starving her during twenty-four hours (not withholding drinking water), and driving her till she begins to tire, just before service. The removal of tumors should be effected by surgical means; closure of the neck

of the womb may be overcome by digital manipulation, which is best effected during heat. The cases of barrenness which are most likely to yield to treatment are those where signs of heat occur at regular intervals, as here the cause is generally of a mechanical nature. But when the animal never shows any sign of heat the prospects of its appearance are very unfavorable. Sexual energy may be restored in mares that have been overworked, or are in a poor condition from want of proper nutrition, by a reversal to freedom from work and liberal keep upon nutritious and stimulating food. In phlegmatic mares, or such where sexual sluggishness or indifference exists, if not due to obesity, they should be fed on rich and stimulating food, often changed, occasionally steamed or cooked, among which may be mixed a handful of hempseeds, twice daily. By way of experiment, fluid extract of damiana may be tried in half-ounce doses, together with tincture of cantharides in half-ounce doses, mixed with half a pint of flaxseed tea, and such a dose given twice or thrice daily during a week, and repeated with intervals of one week during three weeks; meanwhile letting the mare once or twice weekly come near the stallion, or be placed near him in the stable. The medicines may be bought at wholesale price by buying a pound or pint of each; otherwise the experiment will be too costly.

NYMPHOMANIA.

Excessive venery exists in the female as well as in the male, and is evidenced by an insatiable desire for sexual intercourse, the mare appearing to be almost constantly in heat. This condition has several causes for its existence, among which may be mentioned undue irritation or congestion of the ovaries, the fallopian tubes, or the womb, which causes the secretion of a peculiar irritating fluid. Scrofulous affections of the generative organs, or tuberculosis, especially of the body of the womb and its divergences, are known to be frequent causes of nymphomania. The state of the generative organs, under the last-named causes, is such as to render conception impossible; while at the same time the irritation induced by the morbid secretions con-

tinually induces an excessive and unnatural sexual desire. Under the existence of any of these conditions gestation could not exist, neither could conception be accomplished. A mare affected with nymphomania is a continual disturber of the peace and quiet in the stable, and often dangerous while in harness. When this condition has existed only a short time conception may be brought about by spare keep, loosening food and laxative medicines. Two drachms each of camphor and saltpetre, given morning and evening during a week, often allays the excitement and the irritation, when the stallion should be admitted; but it is totally useless to admit the stallion while the excitement of nymphomania exists. In some exceptional instances the amputation of the clitoris has proved successful. In old offenders the last remedy is spaying, and with that the nuisance is abated; but the operation is often dangerous to the life of the mare.

TUMORS WITHIN THE VAGINA AND UTERUS.

These may occur of various kinds and sizes, and frequently have a narrow neck. Their presence may be productive of slimy or bloody discharges of more or less offensive odor. When numerous or large they may cause prolapse of the vagina, difficult urinating, more or less frequent straining, and may hinder or obstruct copulation. Their successful removal, by twisting, ligation, dissection, or by means of the ecraseur, will of course depend upon their location, their shape, form of basis or attachment, etc.

LEUCORRHŒA, OR SO-CALLED WHITES.

This consists of a more or less copious slimy or purulent discharge, originating in the vagina or in the womb, and may be acute and catarrhal or chronic. Among its causes may be mentioned exposure to cold after foaling, other acute or chronic diseases, such as influenza, glanders, etc., or the presence of polypus, melanotic or other kinds of tumors within the vagina or uterus, the existence of recto-vaginal fistula, cancer of the womb, atrophy of the womb, etc. Depending upon the cause, the treatment should be either local or general. If the animal is in poor condition,

treatment should be assisted by liberal keep on nutritious food. Among internal remedies may be mentioned juniper berries, savin, ergot, resin, common turpentine, muriatic acid, oak bark, of which the following formula may serve as an example: Take half an ounce of common turpentine, twenty drops of muriatic acid, two drachms of powdered ginger, and ten ounces of decoction of oak bark. Give such a dose once a day during a week. In cases where the discharge is very profuse sugar of lead and oil of turpentine may be used, as follows: Take one drachm of sugar of lead, dissolve it in a sufficient quantity of warm water, add thereto two drachms of oil of turpentine, previously beaten into an emulsion with one yolk of egg; shake this mixture well together with half a pint of flaxseed tea, and give such a dose morning and evening during a week. The local treatment should be conducted as follows: By inserting the hand it may be ascertained whether the discharge proceeds from the womb, which is likely to be the case if the cervix or neck of the womb is wide open. In this case injection of warm water should be made into this organ by means of a long, flexible catheter, with a view of washing out the contents; after which, by the same means, make injections twice or thrice daily of tar water, clear lime water, or a solution of sulphate of zinc (half an ounce to each pint of water). A change of remedy often hastens the cure of such cases; wherefore, a solution of sugar of lead (two drachms to each pint of water) may be used every second week. The contents of the womb should, as far as possible, be withdrawn before the remedies are injected. In case the disease is confined to the vagina the cleansing and application of medicine may be done by the use of an ordinary syringe that will hold at least half a pint. For uterine application the capacity of the syringe should be from a pint to a quart. If the morbid discharge from the genital parts is due to the presence of polypi, or any other kind of tumors, of course the internal as well as local treatment above suggested will be useless, as a permanent cure under such circumstances would wholly depend upon whether these tumors were removable or not.

COLT FOUNDER, SO-CALLED.

Laminitis, or so-called founder, after foaling, is generally more troublesome or dangerous than the same disease occurring at other times, and from other causes. It is sometimes complicated with metritis, or inflammation of the womb, or some other excitant malady, which should be ascertained, and treatment of such complications directed according to their nature. (See inflammation of the womb.) Among the causes of colt founder is a plethoric condition, resulting from improper diet and regimen during the last months of pregnancy. Mares subjected to moderate work and light, nutritious diet, are seldom affected with this malady, while those kept idle and fed largely on corn or rich food are more commonly affected. In some instances breeders are known to have given their brood mares large and nutritious mashes, with the intention of promoting a large flow of milk. When such a diet is combined with total inactivity, as is common, with a mistaken view of avoiding abortion, a state of plethora is readily induced, which has a great tendency to the development of local inflammations, and among these the so-called colt founder. The treatment should, from the beginning of the evil, be like that adopted for the same disease generally, but more energetic, both locally and internally. Saline laxatives (a pound of Epsom or Glauber's salts, etc.), succeeded with sedatives (aconite, fifteen to twenty-drop doses, not exceeding six doses at intervals of two hours), and poultices applied to the feet, after the shoes have been removed and the edge of the hoof has been pared down, leaving the sole and the frog intact, so that the bearing of the animal's weight comes most upon the central part of the foot. Not the least effective remedy is that of allowing the colt to suck, and, if necessary, additional stripping of the udder, with a view of promoting increased secretion of the mammary glands. In some cases, with acute inflammation and high fever, no milk is secreted; nevertheless the sucking should never be omitted. The return of milk generally indicates a successful issue. A mare subject to such affection should not be bred so as to have her colt too early in the year; for if she could

be turned out on a good pasture before foaling the trouble would most likely be entirely avoided. She must not be fed so as to become plethoric or fat. Give good oats, occasional soft mashes, with bran and flaxseed-meal, say at least once a week, and avoid corn during the last six weeks. Keep constantly some common salt placed within reach, in a separate small trough, and do not mix it among the food. The quantity consumed may safely be left to the animal's instinct, but access to good drinking water, at least thrice daily, should be given. When too early for grass, a roomy, well-littered box-stall, or comfortable, closed shed, should be allowed during the last two months of pregnancy. Give gentle exercise daily, or liberty out-doors during daytime, when the weather is moderate and dry. Accidents from company with other horses, by kicking, etc., may be avoided by providing a small inclosed dry yard adjacent to her shed or box-stall.

ŒDEMA DURING PREGNANCY.

During the latter part of the period of gestation the mare is subject to dropsical swelling, especially of the udder and along the under surface of the chest and abdomen. Such local accumulations, and consequent more or less stiffness, generally disappear after foaling; but sometimes they are apt to become quite extensive, and may call for treatment. Such mares should never be kept tied up in a stall, but should be given the same facilities and liberty as recommended in the preceding paragraph, with access to common salt, as stated. Friction by hand-rubbing, or a stiff brush, and the application of highwine, or spirits of camphor, are among the remedies employed in such cases. Laxative remedies, as well as remedies to excite the kidneys to action, are not safe to employ during the latter part of gestation, as they are apt to produce abortion. Vegetable tonics, such as powdered gention root, may be given among food once or twice a day during a few days to a week, in one-ounce doses.

SUPERIMPREGNATION.

According to its nature, superimpregnation is divided into two forms, technically termed superfœtation and superfœcunda-

tion. Cases of the first form occur after one or more sexual connections during the period of one and the same heat, and the consequence is the production of twins or triplets. The second form appears after coital connection during the time of any subsequent period of evolution or heat; and though there may, in such a case, be two or more fœtuses developing within the uterus at the same time, they can not be regarded as twins or triplets, because their natural term of gestation terminates unequally, the difference depending upon the length of time that passed between the two different acts of conception; and, besides, if no accidental or detrimental influences should occur during the original term of gestation, they would be born of two entirely independent acts of parturition. Superimpregnation, in its two forms, may occur after sexual connection with one or with several males. The difference in time between the two acts of parturition, in cases of superfœcundation, in recorded cases, has been from two to six months.

HEAT DURING PREGNANCY.

As a rule, when conception has taken place, the regular periods of heat terminate, and do not reappear till after parturition. But there are exceptions to this rule, and these are due to the fact that during gestation an ovule may mature, and, as a consequence, heat will appear. This may happen in all species of animals, and during any period of gestation. If during such heat sexual intercourse should happen, conception may take place again, constituting superfœcundation.

LACERATION OF THE RECTUM.

Occasionally reports have come to hand concerning cases where, during the service of the stallion, the rectum became lacerated. These reports invariably contained statements of a fatal termination. While laceration of the rectum may happen during the normal performance of coition, it is, however, more likely to occur when, as sometimes happens, the penis enters the rectum instead of the vagina. Laceration of the rectum during

coition may be considered as incurable and generally causes death of the mare.

ABORTION.

The causes of abortion are numerous. Among these may be mentioned colic, violent external injuries, violent exertions, heroic medicines, musty food, rancid oil-cake, rich and stimulating food in liberal quantities, impure water, etc.; also, disease of the fœtus and its enveloping membranes, and a predisposition after previous abortion. Abortion does not always occur immediately, but frequently after several weeks of preparation; and treatment to prevent abortion is useless after the act has commenced. When it is known that an animal has received an injury, or an exciting cause has been in operation that might produce abortion, some preventive treatment may be adopted, such as small doses of camphor (a scruple to half a drachm) with opium (one scruple) twice or thrice daily during one to three days; or half-drachm doses of powdered sulphate of iron; this latter mixed among food twice a day for a few days.

DIFFICULT PARTURITION.

As before stated the mare should, towards the time of foaling, be placed in comfortable, roomy quarters by herself. She should not be interfered with when foaling, unless there should appear to be unnatural presentation, unusual length of time or other difficulty; and when assistance appears to be necessary preparations should be made to facilitate the same. All stable implements, loose troughs and buckets should be removed, and clean bedding should be furnished. A bucket of warm water and sponge, and oil to lubricate the hand and arm before insertion, should be at hand, as well as a few flat and pliable light ropes, and such obstetrical instruments as may be required. A few strong hands, that may be necessary for assistance, should also be present. The mare should be haltered and held by an assistant. The hand and arm should be oiled, for the purpose of first emptying the rectum of possible contents, as should also the urinary bladder, by gentle compression or by the aid of a catheter,

The hand and arm should then be washed, and it should be remembered that if finger rings are worn they should be removed before the hand is introduced into the genital parts; and if the finger-nails are long they should be shortened.

The complications or unnatural presentations are very various; but a few of the most common will be considered here, as the more complicated cases will require skilled veterinary assistance. The usual and proper presentation of the foal is with both fore legs first, and next, resting upon these, the head will appear. In such a case help is not called for, unless the colt be a very large one, or the mare small with a narrow pelvis, when a little assistance may be carefully given, by gently drawing upon the legs after the head is well forward. But if there should appear only one fore leg, or one or both hind legs, or the head is presented without the legs, or if the legs appear with the head bent down and inwards between them, or is bent backwards, assistance should be rendered without delay. It is generally necessary in such cases to return the foal, but this should be done only between the throes of the mare, and with care not to injure the foal.

One of the most common forms of irregular presentations is the one in which both fore feet appear, with the head doubled back or to one side. Before returning the foal a flat or pliable rope should be fastened to each of the fore legs above the fetlocks. Pressure should then be made against the breast of the foal, and usually the head will then come into line, if the foal is pushed far enough in. The ropes on the feet are applied to secure them in case they should slip into a wrong position, and actual pulling, if any should become necessary after the foal is brought into position, should never be done by these ropes, but by the feet and the head, and not between the labor pains, but only when the mare herself helps.

Should the head be presented without the fore legs a slip-noose of soft cord should be applied around the lower jaw. The head should then be pushed inwards as far as possible, and the feet, one by one, drawn forward into position and secured with

soft rope, as above stated. The head should then, by aid of the hand and partly by the rope, be secured and placed upon the fore legs, when gentle traction, not by the ropes, should be proceeded with as in the foregoing case. It will be useless to attempt to bring the foal forth with the head alone protruding, nor should the attempt be made, as the life of the colt will thus be endangered.

In the case where only one fore leg is presented, the other one extending inwards, and the head pressed against the pelvic bone, the soft cord should be applied around the protruding leg; then the hand, armed with a soft slip-noose, should secure this around the lower jaw, after which pressure should be made against the breast and the foal pushed in so far as to allow the head to be placed in position by an assistant gently pulling on the rope attached around the jaw. Then the other fore leg is to be secured and brought forward, whereupon moderate traction may be made upon both legs and the head, but not by the ropes. If the expulsive pains of the mare are strong the tightly impacted state of the head will offer considerable difficulty in manipulation.

It will be useless to describe the more difficult presentations, as they will require for their safe delivery, where such is possible, a variety of instruments and appliances, with which, and their proper use, the breeder can not be expected to be familiar. In all difficult cases the farmer or breeder will find it to his advantage to send without delay for a properly educated veterinary surgeon, who alone is capable, from his knowledge of the anatomy of the genital organs, of rendering efficient assistance in complicated and difficult cases. But it is to be regretted that the scarcity of this class of men is so great, wherefore much suffering and considerable loss must unavoidably be sustained.

LACERATION OF THE PERINÆUM.

To a mare which such an accident has happened the queer name of a "gill-flirt" is vulgarly applied. The injury consists in a laceration of the space between the anus and the genital organs, caused by difficult parturition, especially in cases where the foal

is very large and the labor pains excessively strong. Treatment, by way of uniting the parts by sutures, generally proves unsuccessful if not instituted immediately after the accident. When the laceration has not included the anal sphincter a partial healing sometimes occurs with surgical assistance. The condition does not unfit a mare for future breeding; but special care is required at the time of service to so direct the stallion (who should stand on higher ground than the mare if she is large) that the vagina proper, and not the rectum, be entered; that is, if the entire extent of the perinæum is lacerated, including the anal sphincter. In this latter event there is also the unpleasant feature of the dung passing from the rectum into the vagina, making the voiding of the same to some extent difficult and more or less incomplete and offensive.

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